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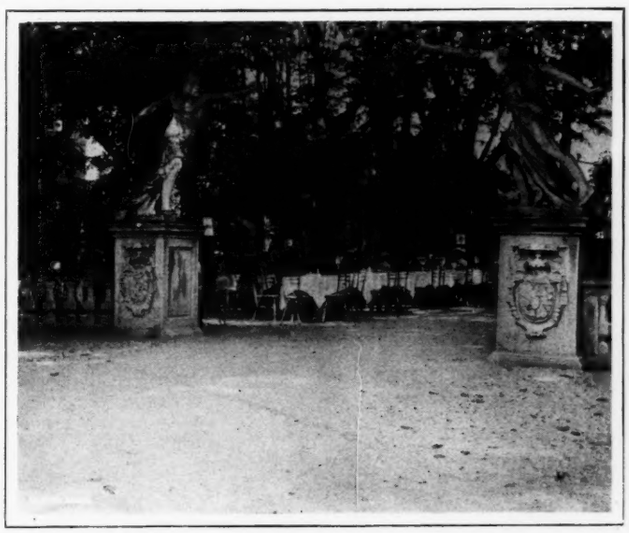
AN APPEAL FOR LARGER USE OF PARKS*

Parks Must Be Useful as Well as Ornamental—Method for Promoting the "Out-of-Door Habit"—Park Picnics Should Be Encouraged

By Stephen Child, Landscape Architect

AT this stage of our civilization it is hardly necessary to discuss the value of public parks for large cities. The importance to health and consequent true economy of such provisions are now very generally recognized, and as much of this creative action depends directly upon the esthetic emotions which the park scenery arouses, no little rivalry has grown up between different cities in the attempt to have the most beautiful park or park system. For it is hardly considered sufficient now for a city to have merely a large rural park, it must also have a more or less well developed system of playgrounds, squares and open spaces connected by tree-shaded boulevards or parkways.

Modern city life with its strenuousness, its commercialism, its steady grind of monotonous labor for so many has brought about, as we all know, numerous forms of nervous disease, and as a result much vitality and energy are lost to the community. These facts have been recognized for years, and it was one of the great arguments used in justifying the expenditure of great sums of money for large naturalistic parks that by furnishing the people of our crowded cities with an opportunity to get away from the sights and sounds of city life into regions of rural landscape without going out of the city, we would do much to relieve the strain of such life and to conserve nervous energy. Certainly something of this relief has been attained and much good has come in this way from these parks, though from the very nature of the benefits derived, it is not to be measured by statistics.



OPEN-AIR RESTAURANT AT SALTZBURG, AUSTRIA

PARKS MUST HAVE MORE THAN SCENIC EFFECT

Two things are now necessary in order that our city dwellers may derive more benefit from our parks:

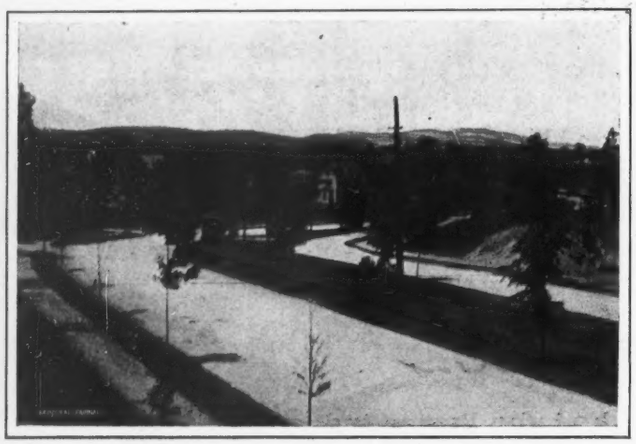
1. There should be a far greater use of the park areas by the people who so much need their restful influences, and this part of the problem involves the education of the masses of the people to utilize these recreative reserves in a much more complete way than they now do.

2. Greater care should be taken to so design our park systems that there is a closer adaptation of park areas to the population's needs.

When one thinks of the vast complexity of the population of our modern cities it becomes evident that no fixed set of rules can be laid down as to the design of a park or park-system for any one of them. Each city has its own peculiarities of population, due to its composite character. The problem must be solved, if at all, by a careful study of this character and of its different aspects, as well as by a careful study of the various topographical and natural conditions which exist, an earnest effort being made to adapt the park system to the peculiar needs of the city in hand. These two principles must always be borne in mind, the social and

* This is the second in a series of three articles, each complete in itself, contributed by Mr. Stephen Child, Landscape Architect, of Boston. The third, "Parks for Industrial Cities," will be published in a near number of the MUNICIPAL JOURNAL AND ENGINEER.—[EDITOR.

topographical, and must be studied together. When looked at in this way the problem becomes most interesting, but we must remember that when satisfactorily solved, the conditions, social and topographical, which make its solution possible in one community, are never to be exactly



PARKWAY WITH TURFED, TREE-SHADED, RESERVED SPACE FOR ELECTRIC CARS

found in any other, and that, therefore, if a park system is perfectly adapted to one city it will be found to be unsuitable in any other, and that different sections of the same city have their different park requirements.

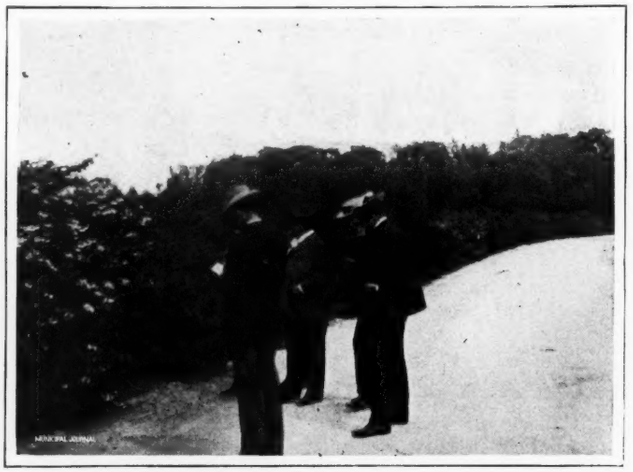
The varying needs of cities as regards park development must be studied intelligently, not only by the landscape architect, but by the park commissioners of each. This is one of the many reasons why such bodies of men should be kept out of politics and selected from the very best elements of each city, and in saying this I do not mean to imply the best educated necessarily, or the wealthiest. I believe that at least one thoughtful broad-minded representative of labor in each city should be included in the park commission membership.

Methods to Promote the "Out-of-Door Habit"

Turning now from the question of the design of new parks and park-systems, a question of absorbing interest and one upon which the writer will have a word to say in another article having special reference to parks for industrial cities, let us now consider briefly some methods by means of which the people in our well parked cities may be stimulated in the desire for more out-of-door life, may be helped to acquire the "out-of-door habit" as it has been called. In this connection it is to be noted that the American Park and Outdoor Art Association is doing splendid work along these lines, a work that should be encouraged by increased membership and interest in this association on the part of the public.

The long hard winters of some of our northern cities, when indoor life is almost a necessity to many, and the habit of hurrying to our homes and staying there is acquired, should only stimulate us to counteract such habits the more vigorously. At almost all seasons of the year we could and should, if properly clad, go out into the open more than we do, and our park systems should not only be planned with that object in view, but should be so administered and maintained that the people are constantly incited to get out to them.

It goes without saying, almost, that, with these things in view, parks should be efficiently policed at all times and well lighted at night. They should be provided with cheap and convenient transportation facilities, so that they may be easily and quickly reached by large numbers of people. These transportation facilities should be more generally advertised than they are in some large communities. Parkway approaches to large parks should in all cases be provided with reserved spaces for electric cars, and these spaces should not be asphalted or paved, but grassed over to deaden sounds, and offer suitable places for the growth of the needed shade trees. Much careful thought should be given by park commissioners and street railway officials to details of these transportation facilities, and these two bodies of men should endeavor to work together. A satisfactory evidence of such co-operation is shown by the appearance of the familiar posters on our street-railway cars, announcing for example: "Good Skating at the Park Lake—Take This Car." This suggestion might well be developed still further and the interest of our stay-at-homes stimulated by such announcements as: "Fine Surf at the Beach," "Light Snow in the Woods," "First Spring Flowers at the Arboretum," "Beautiful Fall Colors in the Woods," and the like. All of these to be followed by the necessary instructions as to the proper car to take to see and enjoy these features. If these details are apparently too trivial for the transportation companies to agree to spend time and money in advertising, park commissioners, or their very enterprising secretaries and superintendents might well take up such matters attending to the details of the necessary posters for the proper street cars. Most of the progressive newspapers in our large cities are sufficiently interested to be willing to allow such announcements to be made in conspicuous places in their columns, and if not made free of charge, as news items, the slight cost of a regular advertisement might well be borne by the park commission. Special, timely, illus-



A NATURE STUDY CLASS AT THE ARNOLD ARBORETUM, BOSTON, MASS.—PART OF BOSTON'S PARK SYSTEM

trated articles in regard to interesting or beautiful spots in our park systems frequently appear now in our Sunday newspapers. These are of great value and their publication should be encouraged by park commissioners who might well supply attractive photographs and suggestions for such articles.

One of the privileges which should not only always be provided, but the use of which should be much more developed, is that of eating and drinking in the open air. We have much to learn in this respect from European cities where this habit is much more fully developed than in America. It is true that in many of our western cities, where the foreign element of the population is large, they have brought with them this custom and we may well thank them for it and make our plans for a more efficient extension of such habits. With this in mind refectories, restaurants and tea-houses should be provided at convenient spots and at places where such structures would not interfere with the harmonious landscape effects, and these features should be so conducted that the charges are reasonably low.

Park Picnics Should Be Encouraged

The picnic habit should be especially developed and for this purpose ample and convenient water supply is most necessary. Advantage should be taken wherever possible of any natural spring for the development of picnic grounds, and where such springs do not occur naturally or where there is danger that such water may be impure, artificial ones may be easily arranged to simulate the natural ones, water being piped to naturally arranged springs, and facilities for small family picnic parties provided. The locations of such spots should be indicated by proper signs and care-takers should see that the almost necessary papers and débris should be removed daily. Such picnicing spots should be advertised and made known to the public and in order to prevent any conflict in their use, might be engaged beforehand in the same way that tennis-courts and ball-fields are now reserved at some of our parks and play-grounds.

There are a number of other privileges that might well be extended and fostered by park commissioners in order to more fully develop the "out-of-door habit" among our city-bred population. Among these might be mentioned that of allowing the picking of flowers and berries under certain restrictions. Then there is the whole matter of nature study by our school children, and park commissioners should co-operate with the school departments in this work and see to it that the native flowers are renewed by proper methods in the fields and woodlands of the parks and children encouraged to collect specimens for their herbariums under the supervision of teachers if necessary. The same remarks apply to the study of geology and natural history. It will soon be impossible in our large cities for the children to find any place where they can conduct such studies intelligently except in our parks, for this work can hardly be done satisfactorily with charts and books, but should be done out of doors, as much as possible, and park commissioners should try in every way to further this movement by supplying the needs of such study, so that our city-bred children may have some at least of the "out-of-door" advantages of the child brought up in the country.

A PLEASANT PICNIC GROUND

These are only a few of the many ways that will suggest themselves to thoughtful, interested people for making our parks more popular than they now are. By some such methods the people of our crowded cities can be made healthier and happier, their perceptive powers can be increased and their standards of morality and refinement greatly improved, for these "out-of-door" influences are all of them soothing, refining and uplifting.

COLLECTION OF GARBAGE IN MANSFIELD

An ordinance regulating the collection and disposal of garbage and rubbish in Mansfield, O., has been passed by the Council of that city, and the provisions of the ordinance are as follows: The term "garbage" is to include animal or vegetable matter that will decompose and become dangerous to health. "Rubbish" is to mean dirt, broken glass, crockery, rags, paper, and other trash. All occupants of property must have metal garbage cans of about ten gallons capacity, to have metal covers, and to be water tight. The cans must be kept on the property where the garbage collector can reach them readily. All dead animals must be carried to the garbage furnace by the owners of said animals, or, if the owner cannot be located within two hours after discovering said animals, the owner or tenant of the premises on which the animals are found must carry the same to the furnace.

Owners or tenants must provide a box for the reception of rubbish which must be carried to the city dumping ground at the expense of the owner or tenant. No one may engage in the business of hauling garbage without a license, except for the purpose of feeding stock, and then it must be in water-tight iron or steel boxes. Regular garbage collectors must call at least once a week on their patrons and remove the garbage in a cleanly manner in water-tight metal tanks or cans. Said tanks or cans are to be washed and disinfected from time to time to the satisfaction of the Board of Public Safety. The price to be charged for garbage removal shall not exceed 10 cents per can of ten gallons. A license tax of $25 for two years must be paid by the collectors, who must remove any garbage offered by the owners or tenants of property, but the latter may not mix said garbage with any matter termed rubbish.

PORTLAND CEMENT*

Its Uses in Engineering Construction—Further Data on Its Chemical Constitution

By E. Kuichling, C. E.†

In the March and April numbers of the Municipal Journal and Engineer, pp. 105-108, 158-161, abstracts were given of the important investigations of Le Chatelier, 1887-1893, and S. B. and W. B. Newberry, 1897; but as chemists are still in doubt about the exact constitution of Portland cement, it becomes of interest to refer briefly to some of the more recent studies of the subject.

Zulkowski's Experiments

The valuable experiments of Messrs. Newberry renewed the interest of numerous other investigators in the subject of the constitution of hydraulic cements, and led to the publication of various modified theories. Among these may be mentioned the works of Karl Zulkowski in 1898 and 1901, in which he regards Portland cement as a mixture of a highly basic slag, composed of lime, silica and alumina, and free lime in an over-burned condition. To prove the presence of such free lime he treated the ground clinker with dilute hydrochloric acid, and obtained a residue which hardened only in alkaline solutions. This method, however, was beset with numerous difficulties, and eventually he concluded that the free lime could not be separated from the cement by chemical processes. He then prepared various hydraulic compounds artificially, and called the products hydraulites.

A careful study of the behavior of these products after they had been finely pulverized and moistened with water, induced him to consider that the best criterion for estimating their practical value was the quantity of water taken up by them in setting, and that their constitution might be deduced therefrom. From his experiments he concluded that di-calcic meta-silicate is the only hydraulite which is of importance in Portland cement, and that the di-calcic ortho-silicate is inactive. To obtain this compound, a very high temperature is necessary, and in the process of burning the ortho-silicate is formed first, after which an increase of temperature converts it into the meta-silicate. The clinker remains in this condition only if cooled suddenly, otherwise it tends to return to the state of ortho-silicate and the mixture of the two causes the mass to crumble spontaneously.

Concerning the compounds of lime with alumina and iron, Zulkowski states that mono- and di-calcic aluminates are easily obtained, set quickly with water and attain great hardness; also that similar calcic ferrites are formed which harden fairly well on hydration. Furthermore, in commercial cements the alkalies exist as silicates, the sulphuric acid is combined with lime as gypsum, and the magnesia acts as a base. Although some of his conclusions are not generally accepted, Zulkowski's work has been valuable in bringing to light some important facts which have induced other chemists to review their investigations in the most critical manner.

Rebuffat's Researches

Another valuable contribution to the subject is that of O. Rebuffat, of Naples, which appeared in an Italian chemical journal in 1898 and in "Thonindustrie Zietung" in 1899. In his experiments the author was unable to obtain tri-calcic silicate, although he applied heat enough to partly melt the platinum crucible in which his raw mixture was burned, but succeeded in producing the other silicates and aluminates of lime described by Le Chatelier and Messrs. Newberry. His product corresponding to tri-calcic silicate behaved differently from that obtained by these chemists, as it dusted or crumbled spontaneously on cooling, even when the material was exposed to the temperature of the electric arc.

He considers that anhydrous hydraulic cements can be grouped into two classes, according to their composition. The first class embraces cements of simple, non-crystalline structure, consisting of a mixture of calcium oxide, ortho-calcium silicate and calcium aluminate, such as hydraulic limes and quick-setting cements. The second class embraces cements of crystalline structure, consisting of di-calcic silicate, calcium oxide and calcium aluminate in varying proportions, such as Portland cements. In the latter, however, the aluminate cannot be ($3CaO$, Al_2O_3), as even with 64 per cent. of lime in the raw mixture the quantity is insufficient to combine with all the silica and alumina to form ($3CaO$, SiO_2) and ($3CaO$, Al_2O_3), as proposed by Le Chatelier.

After being hydrated, both classes of cement consist of a mixture of hydrated calcium silicate, calcium hydrate and hydrated calcium aluminate, with small quantities of inert slag-like substances. In normal Portland cement, the silicate is usually di-calcic and of the ortho form ($2CaO$, SiO_2), while in cement rich in silica a certain quantity of mono-calcic meta-silicate (CaO, SiO_2) is to be expected. The latter does not become hydrated, but reacts with the aluminates to form a double silicate of lime and alumina, a fact which helps to explain the resistance of such cements to the action of sea-water. The aluminate may be in one of three forms, according to the composition of the cement, but is usually either mono- or di-calcic aluminate.

Action of Water and Sugar on Silicates and Aluminates

Rebuffat also studied the action of water and solutions of sugar upon the silicates and aluminates. On mixing the aluminates with a small quantity of distilled water, an increase of volume and temperature occurred. Mono-calcic aluminate (CaO, Al_2O_3) became hydrated in two phases; in the first phase the mass sets and assumes a grayish color, while in the second it becomes white and less compact. On expelling the water taken up in hydration, it was found that the quantity in the gray mass was 33.96 per cent., and in the white mass 43.81 per cent.; in di-calcic aluminate it was 28.92 per cent., and in tri-calcic aluminate it was 28.42 per cent. He also states that when a small quantity of the three aluminates is agitated with a large quantity of distilled water, the substance will be dissolved. If left quietly in water after setting, all the aluminates remain in a compact mass.

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† Engineering Editor, Municipal Journal and Engineer.

On mixing the silicates with a small quantity of water, all of them set and retained their form except the tri-calcic substance, which eventually crumbled. To test them for solubility, he agitated some of the mono- and di-calcic silicate for six days in a flask of distilled water, and found that both were slightly soluble. If, however, lime water was used instead of distilled water, no solution of the substance could be detected. The quantity of water absorbed in hydration was found to be 5.24 per cent. in the case of the di-calcic silicate, of which 3.2 per cent. was lost on heating to low red color, and the remainder at higher temperatures.

With the solutions of sugar, he found that the silicates and aluminates behaved quite differently. The quantity of lime passing into solution increased in both cases with the time during which the substance was immersed, but varied greatly with its composition. Considered in the order of the quantity of lime in the compounds, all of them exhibited greatly increasing losses, but in the aluminates the loss was several times more than in the corresponding silicates. No alumina went into solution, and in the aluminates the residue consisted of $2CaO, Al_2O_3$ + aq., containing 26.7 per cent. CaO and 73.2 per cent. Al_2O_3. The mono- and di-calcic silicates liberated only small quantities of lime, but the dusted tri-calcic silicate yielded a relatively large amount. Similar experiments with mixtures of aluminates and silicates showed that the di- and tri-calcic silicates do not react on the aluminates, while in the case of the mono-calcic silicate a combination occurred which resulted in a larger separation of lime than was found for either of the substances individually.

Opinions of Leduc

In 1902 two other valuable contributions by Rebuffat were published in "Thonindustrie Zeitung," the first dealing with quick-setting cements and the second with di-calcic silicate in Portland cement. In the latter, he reviews the work of E. Leduc, who states that if normal Portland cement clinker is maintained for a considerable time at a temperature of 1,000° C., its color will change from gray to brown and the product will be unsound; also that di-calcic silicate is formed in hydraulic materials at nearly the same temperature as suffices to decompose carbonate of lime; that swelling or checking of the cement may be caused either by burning too long or at too low a temperature; and that every cement which contains more than two equivalents of lime to one each of silica and alumina is formed by long-continued burning into an unsound product consisting of lime, di-calcic silicate and di-calcic aluminate.

With some of these conclusions Rebuffat is in accord, but with others he disagrees, and asserts that his further researches have fully established the essential points brought out in his first paper, an abstract of which is given above. He also maintains that the presence of tri-calcic silicate in Portland cement is a mere hypothesis, and that in the process of hydration di-calcic silicate is not decomposed into mono-calcic silicate and calcium hydrate.

In the foregoing reference has been made to only a few of the recent investigations on the constitution of Portland cement, and it will be seen therefrom that the subject is still unsettled from a chemical point of view. Some of the latest researches, however, embrace extremely interesting optical studies of the material, and before proceeding further it will be profitable to give some attention to what has been done in this direction since the appearance of Le Chatelier's work.

Feret's Microscopical Studies

In 1890, R. Feret published in "Annales des Ponts et Chaussées" an account of his microscopical studies of Portland cement, in which he reviewed the researches of Le Chatelier. Being also an expert chemist, he repeated many of the latter's experiments and made a number of new ones, hoping thereby to establish the subject on a stronger foundation. His work is regarded with high favor in both France and Germany, and in 1903 a translation of it was printed in "Thonindustrie Zeitung."

Feret states that by the action of heat on the raw materials, a large number of complex combinations are produced, differing with the intensity and duration of the temperature, as well as with the quantity of material used. It is, therefore, impossible to make a laboratory test conform to the same conditions that occur in making cement commercially. Even if the laboratory kiln is made in exact miniature of the standard structure, different results will be obtained; hence experiments made with small quantities of material cannot be trusted to furnish the same product that is given by operations on a large scale. For these reasons, he believes that the best indication of the composition of a cement will be gained by the microscopical study of their sections of the clinker.

On examining with polarized light many such sections obtained from a great variety of cement clinker, he found in all a number of compounds, of which two predominated. The first consisted of colorless crystals of cubical form and exhibiting slight double refraction. The second is apparently a vitreous mass filling the interstices between the crystals just mentioned, having no crystalline outlines, varying in color from yellowish red to brownish green, and possessing strong double refraction. This mass is evidently the magma out of which the colorless crystals formed during the first stages of cooling, and its constituents doubtless acted as a flux to facilitate the chemical reactions which take place during the burning. On testing these two substances, the crystals were found to consists only of lime and silica, while the filling mass or magma consisted of lime, alumina, iron and silica.

Feret also prepared and burned a cement mixture containing more iron than usual. In polarized light, thin sections of the clinker exhibited an abundance of well-developed cubical crystals, embedded in a magma which was more yellowish than that of normal cement, and which was also distinctly polychromatic. On pulverizing this clinker and mixing with water, a strong cement was obtained. He could not, however, obtain a firm clinker by burning a mixture of pure carbonate of lime and precipitated silica in normal proportions, as the mass always pulverized spontaneously on cooling, although the dust so produced contained numerous crystalline grains. From these experiments he concluded that the iron acts as a flux, and that in a normal cement the fused mass acts primarily as a solvent, and secondarily as a magma which solidifies on cooling and binds the crystalline substance together.

He also states that different kinds of clinker are generally

produced from the same charge. In some, the magma is greenish blue, while in others it is brownish. The difference in color is probably due to the fact that the iron has not been completely reduced by the gases of combustion. Furthermore, clinkers are found that are nearly white and porous, and undergo marked changes in the course of time. These are termed "dead-burned" cement, and under the microscope the white portions appear to be identical with the crystals, first mentioned. The magma in such portions has therefore been decomposed and volatilized by the high temperature. Before an over-burned clinker becomes white, it undergoes several changes of color, passing from brown to greenish yellow, then to gray and finally, after the flux is entirely decomposed, to white. By analyzing samples of this white substance, he found that it had the composition 3 ($3CaO$, SiO_2) + Al_2O_3, CaO.

On examining hydrated and hardened cements microscopically, numerous small grains resembling the clinker were seen in nearly all cases, and even in samples more than fifteen years old. It is therefore probable that the water of hydration was unable to penetrate to the interior of these grains of tri-calcic silicate owing to the protection afforded them by a surrounding film of impervious magma. In one case the white crystals had entirely disappeared, but the brown magma remained unchanged. In place of the original cubical crystals of the clinker, other crystals appear in hydrated cement. These are usually very small, without definite outlines and form such a confused mass, that their identification is impossible. According to Le Chatelier, they consist of calcium hydrate and mono-calcic silicate. Similar results were observed when the cement powder was mixed with solutions of various salts instead of fresh water.

In the microscopical examinations of specimens of cement mortar, it was plainly seen that the grains of sand had not been attacked, and that the cement acted merely as a binding material which filled the interstices more or less completely. Similarly in the case of mortars made of lime and puzzolana, instead of cement, no evidence of any chemical action between these two substances, or between them and the sand, could be detected.

Feret's studies confirm in general the investigations of Le Chatelier, and served for a number of years to establish the latter's theories of the composition and induration of hydraulic cements. Subsequent researches by other chemists and microscopists, however, led to various modifications of these theories, as will be seen hereafter.

Törnebohm's Petrographic Studies

In 1897 an abstract of an interesting paper by A. E. Törnebohm, a Swedish investigator, was published in "Thonindustrie-Zeitung," wherein the author gave the results of his petrographic and miscroscopical studies of thin sections of cement clinker and indurated cement. From these observations he reached the conclusion that the clinker was composed of four distinct artificial minerals, which he named Alit, Belit, Celit and Felit, associated with a colorless isotropic mass. Of these the most important is alit, which forms colorless rhombic crystals, strongly refractive, but weak as to double refraction. In well developed samples, it sometimes appears in the form of relatively wide strips or prisms, but oftener of hexagonal cross-section. The prisms are frequently fissured longitudinally, and sometimes the fissures intersect. In under-burned clinker, very narrow strips of a substance resembling alit optically, are usually found both separately and interlaced with the larger alit, but this substance can be regarded as alit in the state of abnormally thin filaments. It appears to be composed of tricalcic silicate and highly basic calcic aluminates, along with some magnesia and alkalies when these substances are present in the raw-material.

Belit is somewhat opaque and of a dirty yellowish color. Optically it is bi-axial, strongly double refractive, and displays vivid interference colors by polarization. It forms small, round grains, having no recognizable crystalline outline. These grains sometimes occur singly, and sometimes in groups throughout the mass. They are often striated, and occasionally the marks run in two directions. In amount it is always much less than alit, and is generally found only in well-burned clinker.

Celit is easily distinguished from the other minerals by its dark brown or yellowish brown color. Like belit, it is bi-axial, strongly double refractive and polychroic with polarized light. It is usually developed in the form of little rods in under-burned clinker, whereas in well-burned material it is generally found only in the interstices between the other minerals, but is by no means uniformly distributed throughout the mass, having rather a tendency to appear in spots. It probably belongs to the rhombic system of crystals and serves mainly as a filling material.

Felit generally appears in the form of colorless round, sometimes oblong, striated grains, having no definite crystalline outlines. In the oblong form the striations are always transverse to the longitudinal axis. Optically it is bi-axial and strongly double refractive like belit, and probably belongs to the rhombic system. It is not found in all clinkers, and generally only in such as are deficient in belit, which it seems to be able to replace. If one of these two minerals appears in abundance, the other is usually absent or found only in very small quantity; but not infrequently both are found together in the same sample. As the two substances appear to be interchangeable, they probably also have similar chemical compositions, but as the analysis is difficult, this matter must now be left undetermined.

The colorless isotropic mass is probably an amorphous, vitreous residue which fills the interstices between the four minerals described above. It is more strongly refractive than alit, and cannot always be distinguished easily therefrom; but in specimens from which the alit had been dissolved by chemical treatment, the vitreous mass was seen plainly. While its quantity in the mass is always small, it is by no means inappreciable. In composition it is essentially a calcic silicate similar to alit.

These results agree closely with those of Le Chatelier, the latter's mineral No. 1 corresponding to alit, No. 2 to celit, No. 3a to belit, No. 3b to felit, and No. 3c to the colorless isotropic or vitreous substance. The order in which they are produced in the clinker during the process of burning is not exactly known, but may in general be considered to be:—belit, felit, alit, celit, vitreous substance, although it is very probable that the periods of formation overlap to some extent, so that one is not concluded before the next begins.

Törnebohm made many experiments to test the solubility of these five constituents in water and dilute acids, and found such to be in the following order:—alit, felit, belit, vitreous substances, celit. Pure water acts soon on alit, but very slowly on the others, and if the water contains a small quantity of carbonic acid, its dissolving power is greatly increased. In such water, alit is easily transformed into small rhombic crystals of calc-spar and a gelatinous residue; belit and felit are attacked much less readily, and the action upon celit and the vitreous substances is very slight.

Determining the Chemical Composition

The determination of the chemical composition of these minerals, however, is extremely difficult, on account of the small size of the grains, which are at most 0.1 mm. in diameter, and their relatively easy decomposition by wet chemical means. Törnebohm therefore sought to accomplish the purpose by a series of synthetical experiments with raw mixtures of known composition, and then comparing the results of calcination microscopically. He accordingly prepared at Lomma a standard mixture, to different portions of which he added different percentages of carbonate of lime, silica, alumina, iron oxide and magnesia, thus obtaining about 70 distinct combinations which were duly burned and examined.

While the results gave some indications of the chemical differences between the minerals, they failed to establish the compositions satisfactorily, as in the case of Le Chatelier's similar experiments. Törnebohm then tried to separate alit from the clinker by means of an alcoholic solution of iodine, but this method did not prove entirely successful, as the particles of alit were found to be associated with a considerable quantity of celit. By pulverizing the clinker to grains of 0.01 to 0.02 mm. diameter, and then separating the minerals according to their specific gravities, he obtained somewhat better results, but a perfect separation was not secured. In two cases, however, he succeeded in isolating alit in a sufficiently pure state for analysis, and found the following results:—SiO_2, 20.33 per cent. in both; CaO, 62.33 and 63.65 per cent.; Al_2O_3, 8.67 and 7.19 per cent.; Fe_2O_3, 3.80 and 3.65 per cent.; MgO, 2.48 and 2.62 per cent.; alkalies, 2.05 and 1.84 per cent.

In one of these cases, the alit was separated from the clinker of the normal or standard mixture, while in the other it was separated from that of a mixture having an addition of 4 per cent. of carbonate of lime, and which appeared to consist almost exclusively of alit and celit. The difference in composition of the two samples is very slight, and it is therefore probable that in both cases celit was the only impurity. According to the microscopical examination, not more than 10 per cent. of the substance was celit, and from the chemical investigations of others it was presumed that the iron oxide belonged entirely in this mineral. On this basis and Le Chatelier's formula for the chemical combination of the several constituents, Törnebohm computed that, by reckoning the magnesia and alkalies as lime, the composition of alit was probably X ($3CaO, SiO_2$) + $9CaO, 2Al_2O_3$.

This composition cannot be regarded as definitely established, but it can justly be concluded from the experiments that alit is associated with alumina. Furthermore, although it has not yet been possible to separate the other four minerals of the clinker, it is probable that belit has the composition X ($2CaO, SiO_2$) + $3CaO, Al_2O_3$, along with a small quantity of iron oxide to account for its yellow color; also that, owing to its dark brown color, celit contains most of the iron oxide and has the composition $3CaO\ (Fe, Al)_2O_3, 2SiO_2$.

Characteristics of the Clinkers

Seen under the microscope in thin sections, under-burned clinker is very porous and consists mostly of small, clear grains with rounded edges. Alit and belit or felit are distinctly recognized, together with some grains of calcium oxide, while celit seems to fill the interstices and appears occasionally in the form of small rods. The irregular distribution of celit gives the clinker a mottled appearance; but if it is re-burned at a higher temperature, the spots will disappear, probably because this mineral then attains greater liquidity and diffuses itself more uniformly throughout the mass.

Well-burned clinker is much less porous, and both the alit and belit are better crystallized, while celit appears mostly in the interstices alone. Being rich in iron oxide, the latter mineral is the most easily fusible one, and as the temperature increases, it melts and allows the remaining particles of the mass to acquire a certain mobility and attain closer contact, thereby greatly promoting the formation of alit and belit. Under normal conditions of burning, these two minerals do not reach their melting points; hence the fused celit can fill the interstices of the mass and act as a flux. The celit thus becomes of significance in the quality of the cement, although it is inert in the hardening process.

The familiar tendency of many clinkers to crumble spontaneously on cooling, is due to the fact that at the high temperature attained, certain compounds are formed whose molecular structure is unstable at a low temperature. The tendency of belit to crumble may explain why a crumbling clinker results from long continued burning, whereas if the same raw mixture is burned more rapidly a firm clinker will be obtained. The more the burning is prolonged, the more opportunity is afforded for the ash of the fuel to adulterate the clinker, in consequence of which a crust of crumbling belit, of constantly increasing thickness, forms around each lump. Variations in the tendency of belit to disintegrate may be due to differences in the quantity of alumina, as it is very probable that an isomorphic mixture of calcic silicate and calcic aluminate in certain proportions has a greater molecular stability than in others.

The same remark is also applicable to alit, as it was found in some cases that the addition of lime to the raw mixture caused the clinker to crumble; but it must be remembered that the temperature likewise plays a part which has not yet been sufficiently investigated. Furthermore, a clinker may be firm immediately on cooling, and crumble after it has been exposed to the air for some time. All of the samples which were under-burned exhibited this tendency. Its explanation is that the minerals are not completely formed at the inadequate temperature, thus leaving a portion of the lime in a caustic state, and the slaking of this lime by the absorption of moisture from the air results in the disintegration of the porous mass.

Insufficient burning, however, is not the only cause of

the spontaneous crumbling of cooled clinker, as such disintegration was also observed both in a number of well-burned mixtures and in the briquettes prepared from the product. In these cases the alit appeared to be principally affected, as it crumbled into irregular, double refractive grains of indeterminate character, owing to an unstable molecular structure for which no reason can be given.

Phenomena of Hardening

Much diversity of opinion exists among experts as to the processes which occur when hydraulic cement is mixed with water. Törnebohm examined microscopically thin sections of Portland cement briquettes that had been kept for years, and found that the mass consisted chiefly of a gray, translucent substance, not affected by polarized light. Scattered about in this mass were grains of undecomposed clinker minerals, along with rounded grains of a colorless, scaly mineral, which was slightly refractive and exhibited vivid interference colors with polarized light. This latter mineral appeared to be a new formation filling the spaces occupied by minute bubbles of air and water, as well as very small interstices between the solids, in the original mass. The diameter of these round grains usually ranges from 0.1 to 1.0 mm., but in some cases it was from 2 to 3 mm.

The changes produced by the hydration of the clinker minerals, can best be studied by observing the grains thereof which are found scattered through the mass. In place of an original, relatively large grain of alit, a small granule of sound alit is now seen surrounded by a clear, colorless substance, which is less refractive than Canada balsam and is but slightly affected by polarized light. The thickness of this enveloping substance is from 0.005 to 0.010 mm., and it is the manifest result of a transformation of the alit. Smaller grains of this mineral appear to have been completely transformed, as their original outlines can often be plainly distinguished; and the transformation of the finest particles of alit doubtless results in a homogeneous colorless mass, which is made turbid by particles of the other minerals, and constitutes the gray, translucent substance mentioned above.

It is also seen that particles of belit, celit and felit are not surrounded by an envelope, like those of alit, and that they all have a comparatively fresh appearance, even in samples cut from briquettes more than twenty years old. Only in a few cases was a thin yellowish envelope noticed around some grains of belit.

These observations confirm the opinion of Le Chatelier that alit is the only active substance in Portland cement, but they also show that this mineral is attacked only superficially, since by the action of the water a gelatinous substance is formed which envelopes the grains, and protects them from further decomposition if they are of sufficient size. This fact also demonstrates the importance of pulverizing the cement clinker to the highest practicable limit, as it is found that grains of alit more than 0.02 mm. in diameter are generally never completely decomposed. The larger grains of alit therefore act in part merely as filling material, like the other minerals which are practically inert when acted on by pure water; but if the water contains carbonic acid, the latter also undergo a partial transformation.

It thus appears that the hydration and induration of Portland cement is attended essentially by the production of two new substances from the alit, one being the apparently amorphous mass, which is probably insoluble and may become somewhat crystalline in the course of time, while the other crystallizes immediately in the form of colorless scales, and is probably somewhat soluble in pure water, as it always fills the cavities and minute interstices in the original mass. Both Törnebohm and Le Chatelier regard this latter substance as being calcium hydrate, the presence of which in hardened cement has been confirmed by numerous chemical tests.

The nature of the amorphous mass, however, is much more difficult to determine, and it is very probable that it consists of more than one chemical compound. According to Le Chatelier, its principal constituent is a calcic hydro-silicate of the composition $2(CaO, SiO_2)$, $5H_2O$, and Michaelis believes that it is in a colloidal state on account of its insolubility in water. It may also contain some aluminum hydroxide; but it is improbable that it contains any calcic hydro-aluminates, as these compounds are easily decomposed. The formation of amorphous silica in the presence of free lime must likewise be excluded from any hypothesis. Tests made with dilute acetic acid on thin sections of hardened cement, showed that the amorphous mass was thereby attacked, leaving a gelatinous residue, which can easily be colored and shrivels on being dried. This indicates that the substance is essentially a calcic hydro-silicate.

Besides the two new substances or products of hydration described above, Törnebohm also found some calc-spar on and near the surfaces of a number of briquettes, but never in appreciable quantity in their interior. The surface of some old specimens was found to consist principally of this mineral, and hence its formation should be taken into account. It is composed of calcium carbonate, Ca,CO_3.

The processes of hydration and hardening of Portland cement thus appear to be as follows:—When water is mixed with the pulverized cement, the surfaces of the grains of alit are first attacked, the action being more vigorous in proportion as the alit contains more alumina and the water more carbonic acid. By the separation of lime, a little silica and alumina and the alkalies, each grain becomes surrounded by a gelatinous envelope which swells as more water is absorbed. The swelling brings the envelopes into close contact, whereupon they adhere and make the entire mass coherent. This first reaction is the "setting" of the cement, and its intensity soon diminishes because the formation of the gelatinous envelopes arrests further decomposition of the alit.

The subsequent hardening of the mass depends partly on the slow continuation of the first process, but mainly on the gradual crystallization of the calcium hydrate, which ultimately fills completely all cavities and interstices. In his experiments, Törnebohm found that the crystals of calcium hydrate always adhered firmly to the glass on which they were formed by the evaporation of the water; and hence when formed in the cement or mortar, they doubtless contribute much to its strength.

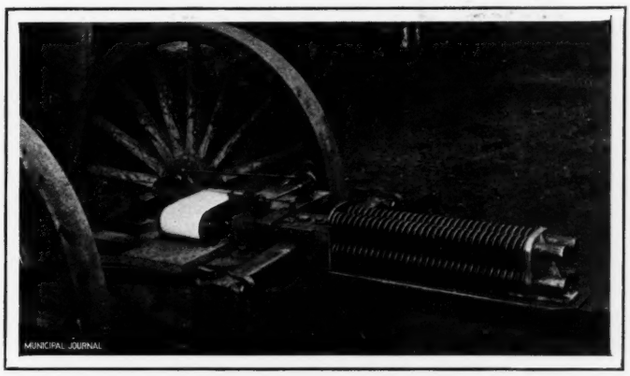
(To be Continued)

WIDE TIRE TESTS

Report of a Board of Officers of the Ordnance Department of the United States Army—Description of Tractograph Used—Results Obtained

By Captain Lawson M. Fuller

A BOARD of officers was convened by order from the War Department of the U. S. Government to make such tests as would determine the relative merits of different widths of tire on a single howitzer carriage and limber fitted with a tractograph on different kinds of roads and of ground,



LIMBER AND TRACTOGRAPH

such as would be met with in actual field service, including macadam, cinder and wood roads, plowed ground, sod, sandy loam, and deep mud. As the readers of the MUNICIPAL JOURNAL AND ENGINEER would be interested only in the tests on macadam roads, only that test is described, but the results deduced by the Board from all the tests are given.

To make the results comparative the same carriage, limber and tractograph were used for all the tests, changing the wheels only.

CONSTRUCTION OF THE TRACTOGRAPH

The tractograph was constructed as follows: A worm fitted to the hub of the left limber wheel engages in a worm wheel at the end of a shaft, at the other end of which is a bevel gear. This gear engages in another bevel gear on a shaft at right angles to the first and by means of a second set of bevel gears transmits the motion of revolution of the limber wheel to one of two cylinders on which is wound the paper for taking the record. The paper is wound on this cylinder from a second cylinder, the motion to which is transmitted from the first cylinder by a belt which also serves to keep the paper stretched. Between the two cylinders is a table which is under that part of the paper on which the record is being made and furnishes a smooth surface for the pencil points to move upon.

The doubletree is attached to a block with a collar passing around the pole. This block bears against four spiral springs the other ends of which bear against a top fastened to the pole. Attached to this block is a small jointed arm which holds a pencil directly over the paper. This pencil may be raised and held above the paper when no record is being taken, but, when released, the point of the pencil is constantly pressed against the paper by a small spiral spring. A second pencil similarly arranged, except that it is not connected with the doubletree, serves to mark the line of origins. This pencil is so adjusted that its point is on a line with the point of the first pencil when no pull is being exerted.

The tractograph is so geared that the paper will move .276 of an inch for each turn of the limber wheel, or one inch on the record corresponds to 58.5 feet of travel of the limber.

The record is made as follows: The pull of the horses is transmitted directly to the doubletree and the arm carrying the pencil. The distance from the origin line to the point of the pencil at any time is the distance the spiral springs have been compressed at that time. The paper, which is moving under the point of the pencil, takes the record in the form of a curve, the ordinate of which at any point measures the corresponding compression of the springs.

These springs have been accurately tested and for each spring one-half-inch compression requires 100 pounds pressure, so that one inch on the record corresponds to 800 pounds pull. A planimeter was used to measure all areas under the curves.

Four sets of wheels were used; viz, with three-inch, four-inch, five-inch, and six-inch tires. The wheels were four-inch service wheels altered for the three-inch, five-inch, and six-inch tires by changing the felloes to suit.

The sideplates were disks of galvanized iron and were

CARRIAGE WITH SIX-INCH TIRES AND SIDE PLATES STUCK IN DEEP MUD

fastened by screws one on each side of the wheels. The object of these plates was to prevent the mud from packing between the spokes.

The track of the limber wheels and the carriage wheels is the same. The weights were as follows:

Carriage, gun and limber with tractograph, 3-inch wheels	9,325	lbs.
Limber, with tractograph, 3-inch wheels	1,550	"
Carriage, with gun, 3-inch wheels	7,775	"
Weight of limber wheels, limbered up, 3-inch tires	4,060	"
Weight on carriage wheels, limbered up, 3-inch tires	5,265	"
Tractograph, about	35	"
3-inch wheels each	296	"
4-inch wheels each	332	"
5-inch wheels each	349	"
6-inch wheels each	420	"
Side plates with screws, each	7	"
4 sets (8 side plates)	56	"

In conducting these tests the wheels did not track in ruts previously formed unless expressly stated. On the macadam, cinder and woods roads, three teams of horses were used while four teams were used in the sandy loam and on plowed ground, and five teams on the sod and deep mud. The tests were carried on for ten days and on seven different kinds of roads. In addition, separate tests were made to show the results of tracking narrow tires in ruts made by wide tires, the results of tracking in ruts made by tires of same width, and the merits of side plates in deep mud.

No effort was spared to have the conditions the same during each set of tests and such trials as were not comparative did not receive consideration by the Board. The macadam road was hard and smooth and the wheels made no impression as shown in the photograph. The pull increased slightly as the width of the tires increased.

Results of the Tests

The results of the deep mud tests show that, when the mud is deep and sticky and packs between the spokes, the

MACADAM ROAD ON WHICH NO IMPRESSION WAS MADE

pull decreases as the width of the tire decreases, but that when the tire becomes too narrow and the depth of the mud increases rapidly, the pull begins to increase. Side plates decrease the pull to some extent in deep mud, although some mud adheres to them, but this advantage is not considered enough to outweigh their disadvantages; viz, they are easily bent, wheels equipped with them are more difficult to handle and they present a bad appearance. The pull required going through deep mud is less when following the track of a wheel with the same width of tire than when making a new track.

The above tests confirm, in all essential respects, the average of the combined results deduced in the tests made by the Experimental Station of the University of Missouri, in 1897,

DEEP MUD—CARRIAGE WITH THREE-INCH TIRES STUCK

by Studebaker Brothers in 1892, and by the British Association for Advancement of Science in 1902.

The tests by the Board show:

1. On hard smooth roads with no obstructions the tractive effort increases slightly with the width of the tires.

2. On unmade roads, ploughed ground and sandy loam the tractive effort increases as the width of the tires decreases.

3. In deep mud which is sticky, adheres to the felloes and packs between the spokes, the tractive effort decreases as the width of the tires decreases until the tires become too narrow, and the depth of the ruts increases rapidly when the tractive effort begins to increase.

4. In all cases, wide tires leave the road in better condition than before they passed over it. The wider the tires the more marked is the improvement to the roads.

These results, in connection with the results of the tests previously referred to, show to the satisfaction of the Board the following more general results:*

1. The wide tires require slightly more tractive effort on hard, smooth roads and on good roads covered with dust or slight slush. In all cases of roads or ground where the mud adheres to the felloes or packs between the spokes, the tractive effort required is greater for wide tires.

2. That wide tires require less tractive effort than narrow tires on all other classes of ground or roads.

3. That wide tires leave the road bed in better condition than before passing over.

The question of determining the width of tires depends upon the object sought in the particular case under consideration. In the case of seige gun carriages, the important point to be considered is, in the opinion of the Board, not what width of tires is most advantageous on the good road or average roads, but what width of tires is the most advantageous under the most adverse conditions which might be encountered in an active campaign.

To supply the different kinds of roads on which tests were

* In a few unimportant cases, the results which have been obtained differ slightly, but for all classes of roads, important from a military standpoint, the general results are the same.

made with a multiplier that would show the importance of each road in actual campaigns, the Board gave the deep mud roads a value of fifteen out of thirty-five, which it considered a trifle low. Thus the multipliers were: For the macadam road, 1; for the cinder road, 1; for the woods road, 2; for sod, 3; for plowed ground, 5; for sandy loam, 8; and for deep mud, 15. Therefore, by multiplying the average pull in pounds recorded by the tractograph, by these road values for the different widths of tire, the relative values of three, four, five, and six-inch tires under different conditions of road were determined. Thus, the total weight so determined with the three-inch tires was 64,744.32; for the four-inch tires, 58,227.37; for the five-inch 58,732.24, and for the six-inch 59,091.12. These results show an advantage in favor of the four-inch tires, which advantage will increase if increased importance be given to the deep mud class. Attention is called to the relatively poor showing made by the three-inch wheels.

RECORD OF WIDE TIRE TESTS

One inch compression of springs of tractograph equals 800 pounds.
One inch length of record equals 58.5 feet of travel. The cut in next column shows tractograph records, the heavy lines mark the inches, which are subdivided into tenths.

Three-Inch Tires *

Kind of Road.	Record number.	Area under curve—sq. in.	Length of record—in.	Average pull. Inches.	Average pull. Pounds.	Remarks.*
Macadam Road	1	1.77	10.3	.17184	137.5	a
Cinder Road—packed first 50 yds. up 3 per cent. grade	3	7.25	10.25	.7073	565.84	b
Woods Road	2	12.38	10.1	1.2257	980.56	c
Sod—spongy	32	6.72	4.97	1.3521	1081.68	d
Plowed Ground—across furrows	14	20.67	9.85	2.0984	1678.72	e
Plowed Ground—across furrows, wheels tracking 6, 5, 4, 3 in.	26	13.87	10.25	1.3531	1082.48	
Sandy Loam—dry	13	26.84	9.32	2.8798	2303.84	f
Sandy Loam—dry, wheels tracking 6, 5, 4, 3 in.	25	12.28	10.12	1.2134	970.72	
Deep Mud	50	15.90	5.90	2.6677	2134.16	g
Deep Mud—wheels tracking in their own ruts	51	15.71	6.20	2.5338	2027.04	h
Deep Mud—with side plates	42	14.25	6.1	2.3361	1868.88	i
Deep Mud—considered only with side plate test above. NOT CONSIDERED	40	15.15	6.13	2.4714	1977.12	k
Deep Mud	27	5.57	1.93	2.8860	2308.80	m
Deep Mud	33	15.20	4.90	3.1020	2481.60	n

* Weight of carriage, limber, gun and tractograph complete, 9,325 pounds. Weight of side plates, 53 pounds.

a No ruts. b Slight ruts; struck soft places at beginning of test. c Ruts 1 to 6 inches deep. d Ruts 1 to 3 inches deep. e Ruts 4 to 8 inches deep. f Ruts 8 to 12 inches deep. g Ruts 6 to 24 inches deep. h Ruts 8 to 24 inches deep. i Ruts 6 to 18 inches deep. k Ruts 7 to 18 inches deep. m Stuck in mud; wheels blocked before it could be gotten out. n Stuck in mud; block and tackle used to pull it out.

Four-Inch Tires †

Macadam Road	4	1.8	10.45	.1722	137.76	a
Cinder Road—packed first 50 yds. up 3 per cent. grade	6	6.28	10.37	.6056	484.48	b
Woods Road	5	10.48	10.22	1.0254	820.32	c
Sod—spongy	30	6.64	4.93	1.3468	1077.44	d
Plowed Ground—across furrows	16	17.6	9.95	1.7789	1423.12	e
Flowed Ground—across furrows, wheels tracking 6, 5, 4, 3 in.	24	13.00	10.05	1.2935	1034.80	
Sandy Loam—dry	15	24.12	9.50	2.5389	2031.12	f
Sandy Loam—dry, wheels tracking 6, 5, 4, 3 in.	23	12.21	10.00	1.2210	978.80	
Deep Mud	44	15.10	6.17	2.4473	1957.84	g
Deep Mud—wheels tracking in their own ruts	45	14.20	6.15	2.3089	1847.12	h
Deep Mud—with side plates	39	13.75	6.15	2.2357	1788.56	i
Deep Mud—considered only with side plate test above. NOT CONSIDERED	41	13.34	5.9	2.2610	1808.80	k
Deep Mud	31	17.71	6.00	2.9516	2361.28	m

† Weight of carriage limber, gun and tractograph complete, 9,469 pounds. Weight of side plates, 53 pounds.

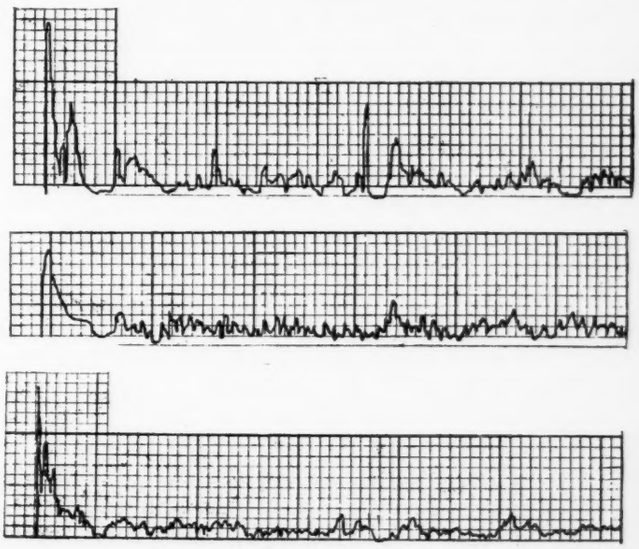
a No ruts. b Slight ruts. c Ruts 1 to 6 inches deep. d Ruts 1 to 2 inches deep. e Ruts 3 to 7 inches deep. f Ruts 6 to 12 inches deep. g Ruts 6 to 20 inches deep. h Ruts 7 to 21 inches deep. i Ruts 6 to 15 inches deep. k Ruts 6 to 18 inches deep. m Not a comparative result; mud too deep and wet.

Five-Inch Tires ‡

Kind of Road.	Record number.	Area under curve—sq. in.	Length of record—in.	Average pull. Inches.	Average pull. Pounds.	Remarks.¶
Macadam Road	7	1.9	10.54	.1802	144.16	a
Cinder Road—packed first 50 yds. up 3 per cent. grade	9	6.49	10.17	.6381	520.48	b
Woods Road	8	10.02	10.35	.9855	788.40	c
Sod—spongy	37	6.20	4.94	1.2551	1004.08	d
Plowed Ground—across furrows	18	17.08	10.07	1.6961	1356.89	e
Plowed Ground—across furrows, wheels tracking 6, 5, 4, 3 in.	22	14.95	10.18	1.4685	1174.80	
Sandy Loam—dry	17	19.66	9.45	2,0804	1664.32	f
Sandy Loam—dry, wheels tracking 6, 5, 4, 3 in.	21	13.50	10.18	1.3261	1060.88	
Deep Mud	46	15.92	5.90	2.6983	2158.64	g
Deep Mud—wheels tracking in their own ruts	47	15.17	5.96	2.5453	2036.24	h
Deep Mud—with side plates	34	14.74	6.05	2.4363	1949.04	i
Deep Mud—considered only with side plate test above. NOT CONSIDERED	38	12.36	6.04	2.0463	1637.04	k
Deep Mud—with side plates	43	14.56	5.91	2.4636	1970.88	m

‡ Weight of carriage, limber, gun and tractograph complete, 9,537 pounds. Weight of side plates, 53 pounds.

a No ruts. b Very slight ruts. c Ruts 1 to 5 inches deep. d Ruts 1 to 2 inches deep. e Ruts 2 to 5 inches deep. f Ruts 5 to 10 inches deep. g Ruts 6 to 18 inches deep. h Ruts 7 to 19 inches deep. i Ruts 6 to 14 inches deep; stuck but pulled out. k Ruts 6 to 14 inches deep. m Side plate torn off and buckled at places; mud packed between spokes where plates were torn off.



TRACTION RECORDS ON MACADAM ROAD

Top line, 3-inch tires—Center, 4-inch tires—Bottom line, 5-inch tires.

Six-Inch Tires ¶

Macadam Road	10	2.76	10.20	.2706	216.48	a
up 3 per cent. grade	12	7.22	10.30	.7009	560.72	b
Cinder Road—packed first 50 yds.						
Woods Road	11	9.72	10.25	.9483	758.64	c
Sod—spongy	35	6.98	5.05	1.3821	1105.68	d
Plowed ground—across furrows	20	16.64	10.05	1.6557	1324.56	e
Plowed Ground—across furrows, wheels tracking 6, 5, 4, 3 in.	20	16.64	10.05	1.6557	1324.56	
Sandy Loam—dry	19	18.31	10.03	1.8255	1460.40	f
Sandy Loam—dry, wheels tracking 6, 5, 4, 3 in.	19	18.31	10.03	1.8255	1460.40	
Deep Mud	48	16.97	5.83	2.9108	2328.64	g
Deep Mud—wheels tracking in their own ruts	49	16.23	6.05	2.6826	2146.08	g
Deep Mud—with side plates	29	14.36	5.93	2.4211	1936.88	h
Deep Mud—considered only with side plate test above. NOT CONSIDERED	36	14.73	6.25	2.4714	1977.12	i
Deep Mud—with side plates	28	17.23	5.85	2.9453	2356.24	k

¶ Weight of carriage, limber, gun and tractograph complete, 9,821 pounds. Weight of side plates, 53 pounds.

a No ruts. b Very slight ruts. c Ruts 1 to 4 inches deep. d Ruts 1 to 2 inches deep. e Ruts 2 to 4 inches deep. f Ruts 4 to 7 inches deep. g Ruts 6 to 18 inches deep. h Ruts 6 to 14 inches deep. i Ruts 6 to 12 inches deep. k Stuck in mud; wheels blocked up and pulled out to one side.

BRICK PAVEMENT CONSTRUCTION *

Some of the Neglected Details—Width of Pavement—The Sub-grade—The Foundation—The Brick—The Cushion—The Joint Filler

By Ira O. Baker, C. E.

IRA O. BAKER, C. E.

THE outline of the method of constructing a brick pavement is so generally understood as to make it unnecessary in this paper to give a description of the several operations, and therefore attention will be centered upon those parts of the work that seem to have received the least attention, or at least seem most to need attention. The subjects to be considered will be taken up approximately in the order in which they occur in the work of construction.

WIDTH OF PAVEMENT

In many cases a considerable part of the money spent for a pavement is wasted by making the pavement wider than is necessary. A narrow pavement not only costs less to construct, but also costs less to clean and sprinkle. Of course, except for the cost the wider the pavement the better; but length is more desirable than width. An excessive width is a needless expense and delays or wholly prevents the getting of any pavement at all; and hence one help towards securing pavements is to make them only wide enough to accommodate the traffic.

It is not unusual to find residence streets in small cities, without street car tracks, with pavements thirty-six to forty feet wide. The only travel over such streets consists of private carriages and the delivery wagons that supply goods of various kinds to the residents. All the pavement that such streets really require is a width such that two vehicles may pass at reasonable speed and with ordinary care without interference. A width of eighteen feet affords sufficient room for a vehicle to pass when another is standing on each side of the pavement—a rare occurrence—and therefore it appears that a pavement eighteen feet wide, or at most twenty feet, is sufficient for the less frequented streets. Therefore any money spent to construct a wider pavement is not only absolutely thrown away, but the cost of sprinkling and sweeping is also needlessly increased. Further, narrowing the pavement increases the lawn space, which not only improves the appearance of the street, but also gives additional space in which to place gas pipes, water pipes, etc., and thereby prevent the tearing up of the pavement, which is always a damage. The only objection to a very narrow pavement is the difficulty of turning a team on it. The seriousness of this objection depends upon the construction of the vehicle. Many delivery wagons, express wagons, etc., may be turned easily on an 18-foot pavement. If occasionally a vehicle is compelled to go to the corner to turn, or even to drive around the block, the inconvenience is not very serious, and is so infrequent as not to justify any considerable expense to prevent it. If the block is long, or if the objection to some vehicles being compelled to drive around the block is considered important, then it is much cheaper to construct a turning place near the center of the block than to build an additional strip of pavement the entire length.

The cost of pavement, per square yard, is practically independent of its width, and therefore the reduction of the width of the pavement on residence streets from thirty-six or forty feet to eighteen or twenty feet will save nearly 50 per cent. of the cost, and if the cost can be reduced one-half the number of paved streets will be increased much more than proportionally.

It is not wise to take time to discuss the width of pavements on residence streets containing car tracks, nor on business streets, but a little investigation will show that in many cases the pavement is considerably wider than has been found entirely satisfactory under similar conditions. The views here expressed are not mere theory, but are supported by experience in a number of cities. In recent years there has been a marked tendency, in the middle West at least, to reduce the width of pavements on residence streets, and on business streets in the smaller cities. Attention is here called to the matter because far too often the width of the pavement is made a fixed proportion of the total width of the street regardless of the real needs of travel. This is only one of the many ways in which many municipalities suffer from the lack of more competent engineering service—the loss frequently being many times the saving.

THE SUBGRADE

It is unnecessary to say that the subgrade is the ultimate support of any pavement, and that both the cost and the efficiency of a pavement depends upon the supporting power of the soil upon which it rests. There are only two ways of increasing or supplementing the supporting power of the subgrade: (1) by underdrainage, or (2) by constructing a pavement that will distribute the concentrated load of the wheel over a considerable area of the subgrade. Usually the former is both the cheaper and the more effective. Tile drainage is cheap to construct, is certain in action, and costs nothing for maintenance. With all soils, except clean dry sand, the cost of both the construction and the maintenance of the pavement could be materially decreased by proper underdrainage.

Not only should the subgrade be properly drained, but it should be thoroughly rolled to compact the surface and also to reveal any soft spots. Usually just before a pavement is to be constructed, the street is dug up to lay sewers, and water and gas pipes and to connect these with the private property; and almost universally the trenches are refilled in

* A paper read before the Eighteenth Annual Convention of the National Brick Manufacturers' Association, recently held in Cincinnati, O. The author, Ira O. Baker, is professor of civil engineering in the University of Illinois, Champaign, and the author of "Roads and Pavements," published by John Wiley and Sons, New York.—[EDITOR.

such a manner that great care and skill are required to construct a pavement which will not ultimately settle over the trenches, much to the damage of the pavement and the disfigurement of the street. It is always specified that the subgrade shall be thoroughly rolled; but it needs only a casual inspection of the pavements of any city to show that this is seldom done in a manner to prevent settlement, is to properly refill the trenches; but usually this is indifferently done, owing to the ignorance or the carelessness of the proper municipal officer, and as a consequence the remedy of this defect is left to the paving contractor. The subgrade should be rolled both longitudinally and transversely with a steam roller weighing not less than five tons. If the street is rolled in only one direction, only one set of trenches will be compacted. The subgrade can not be rolled transversely with a horse roller; and besides the horses' feet tear up the subgrade nearly as much as the roller compacts it, particularly when the rolling is almost completed. The roller should pass over the surface several times to settle the filling into the trenches and also to compact the surface by the kneading action of many passes of the roller. Unfortunately the specification requiring the use of a steam roller adds somewhat to the cost of a pavement, since that implement is expensive in first cost and also in maintenance, and since ordinarily it can be used only a comparatively short time each year; but its use is believed to be worth its cost, particularly if the trenches were not properly back-filled.

The Foundation

Brick Foundation. The first brick pavements were laid on a foundation consisting of a layer of gravel and a course of brick laid flatwise. This form of foundation has been all but abandoned for two reasons: First, because some other form is usually cheaper; and second, because of the lack in the past of proper precautions in laying the foundation. There have been two defects in constructing this form of foundation. First, the gravel is neither spread nor consolidated uniformly. This point will be considered fully later. The second defect consists in laying broken bricks with their broadest side up, and hence the space below is not well filled while the cushion coat is being spread, and consequently after the pavement is completed the cushion coat works into these cavities and permits the surface of the pavement to sink. If all broken brick are laid on the broad side and care be taken thoroughly to fill the joints while laying the cushion coat, this form of foundation will give satisfaction, even though the lower course of brick be quite inferior. The writer is quite familiar with a piece of such pavement laid on a very unfavorable subgrade, but with proper precautions in the two respects mentioned above, which for ten or fifteen years has given entire satisfaction and has as good a surface as adjoining pavements on a concrete base, even though the latter are on a more favorable subgrade and carry less travel. This pavement illustrates a rule of construction that cannot be repeated too often, viz.: no good brick pavement can be constructed without proper attention to all details.

Concrete Foundation. Nowadays it seems to be the general belief that a 6-inch concrete base is necessary for a brick pavement; at least this foundation is based indiscriminately for business and residence streets, and is used indiscriminately also on the stiffest soil and on the softest. A 6-inch concrete foundation is ordinarily used under an asphalt pavement, which is a more or less flexible layer from two to three and one-half inches thick; while the same thickness of concrete is ordinarily used with a brick pavement having a cement filler, which is a very rigid layer from five to seven inches thick. Is there any evidence that the foundations of asphalt pavements are generally weak?

An engineering journal recently contained an account of a test of the supporting power of an asphalt pavement, made by hauling over it a truck weighing 22,300 pounds and giving a pressure of slightly over three tons on two wheels having tires four inches wide. The foundation consisted of a 4-inch layer of natural-cement concrete mixed in the proportion of one part cement, two parts sand, and five parts crushed stone. The asphalt wearing surface was two inches thick. The subgrade consisted of "soft wet clay which had been much disturbed by many trenches for sewers and for water and gas pipes." The pavement had been in use twelve years when tested, and had shown no signs of failure. "The above load was hauled over this pavement from end to end and produced no effect upon the pavement except to make a slight depression in the asphalt where the wheels stood for half an hour, the day being warm."

Does this prove that the concrete foundations of brick pavements are generally needlessly thick? Surely if four inches of concrete over soft clay and under a 2-inch asphalt wearing-coat can support such loads, the six inches of concrete is surely needless under brick pavement with cement filler.

Let us consider this question from another point of view. There are three and only three reasons for constructing a pavement, viz: (1) to secure a smooth surface for ease of cleaning and to decrease tractive resistance; (2) to secure an impervious roof to prevent rain water from softening the subgrade; and (3) to interpose a layer that shall distribute the concentrated load of the wheel over so great an area of the subgrade that it can safely support the load with depression. For the moment, we are not concerned about the smoothness of the surface, and hence nothing will be said here about the first reason for constructing a pavement. The wearing surface of a brick pavement is practically impervious whether sand or cement filler be used, and consequently a concrete foundation is not necessary to secure a water-tight roof to protect the subgrade. Therefore, the concrete foundation of a brick pavement acts only to distribute the load of the wheel over the subgrade. The concrete distributes the load by virtue of its ability to act as a beam; and this property, is due to the cement which the concrete contains. If there were no cement in the concrete, the layer of gravel or crushed stone would distribute the concentrated load of the wheel over a considerable area. The pressure of the wheel is transmitted downward in diverging lines; and if the point of contact of the wheel is considered as the apex of a cone having its base on the subgrade, it may be assumed that the load of the wheel is distributed nearly uniformly over the base of this cone. It is unwise to attempt here to go into the mathematics of the subject further, but the efficiency of a layer of broken stone in distributing a concentrated load is proved by the fact that, under favorable circumstances as

to soil and drainage, four inches of broken stone has successfully carried considerable traffic, while 6-inch macadam roads are quite common in a number of States. If four or six inches of macadam without any other pavement will carry the traffic, the same thickness will certainly make a good foundation for a brick pavement under ordinary conditions—particularly if a cement filler is used, since the filler gives the course of brick a considerable transverse strength, as will be discussed later. The writer recently saw a piece of brick pavement with sand filler which is laid directly upon the black loam of the Illinois corn belt, which for six or eight years has carried the heaviest travel of a city of three or four thousand inhabitants and which is still in good condition. A tile drain was laid at each side of the street, the subgrade was well rolled, and the paving bricks (not blocks) were laid upon a layer of sand and small gravel only one or two inches thick. Probably no small part of the success of this pavement is due to the fact that a prominent and intelligent and successful local business man acted as inspector. The writer does not advocate the general adoption of this form of construction; but cites this case to show what can be done by intelligence and care, and prove that a layer of concrete is not always necessary. A needlessly expensive form of construction is not only money wasted, but deters the construction of other pavements.

Not infrequently pavements having a concrete foundation are found which have settled over trenches. Does not this prove that the ordinary concrete foundation is not strong enough? No, it simply proves that the foundation over the trench is not strong enough. There are two remedies for this condition of affairs. Either consolidate the filling in the trench better by rolling or tamping as described above; or make the concrete thicker over the trench. The first is cheaper and more scientific. In no case is it justifiable to thicken or strengthen the foundation over the entire street simply because trenches occupying from 5 to 10 per cent. of its surface may not have been properly back-filled.

Before considering substitutes for concrete foundations, let us examine the concrete a little further. Formerly it was the custom to use a rich, natural cement concrete, because it was cheaper than a Portland cement concrete of equal strength. A few years ago nearly all the Portland cement used in the country was imported, while now nearly all of it is of domestic manufacture; and further it is not only home-made, but it is both better and cheaper. Although natural cement is marvelously cheap, a concrete of a given strength can be made cheaper of Portland than of natural cement. Experiments made at the University of Illinois show that a concrete composed of one part Portland cement, eight parts of coarse sand or fine gravel, and eight parts of screened or broken stone was considerably stronger in compression and also in bending as a concrete composed of one part natural cement, three parts of the same sand, and three parts of the same broken stone. These proportions have been practically tested in the construction of half a mile of pavement the past summer with the greatest satisfaction to all parties concerned. Prices vary greatly with the locality, but in most, if not all, cases Portland cement concrete is cheaper in proportion to strength than that made with natural cement.

Before dropping the subject of concrete foundations, a few words should be said in condemnation of the quite general practice of leaving the upper face of the concrete needlessly rough and irregular, with loose stones strewn over the surface. To secure a uniform surface for the pavement, the cushion coat should be of uniform thickness, and hence the top face of the concrete should practically be parallel with the surface of the finished pavement. Also any loose stones on top of the concrete causes the brick to be broken during the rolling and produces inequalities in the surface of the finished pavement. Both of these effects can be eliminated without appreciable expense by a little care.

Finally, although brick pavements are usually laid upon concrete foundations, it by no means follows that a concrete base is either necessary or most economical. A course of gravel or broken stone, when properly laid, will make as good a foundation as a layer of concrete, and in some cases is cheaper. Further, less skill is required with a gravel or broken stone foundation than with a concrete foundation. Those who have made cuts into concrete pavement foundations report that in a majority of cases the concrete is no better than a layer of broken stone without cement, due apparently to carelessness, or inefficiency, or dishonesty in the construction. The process of placing gravel or broken stone is simpler, and therefore there is less danger of inferior work; and the gravel or broken stone requires less hand labor, which is an advantage to contractors in these days of inconsiderate demands of laboring men. As to whether concrete, gravel, or broken stone should be used for the foundation in any particular case depends upon local prices and the local conditions; and right here is where the city needs engineering advice of a high order, for a single word in the specifications may add hundreds of dollars to the cost of the work without any return. It is more scientific and usually more profitable to give time to the consideration of the specifications than to higgling with the contractor.

(To be Concluded in June)

PROHIBITION WORKS HARM

Experience has shown, according to Mayor Cyrus W. Davis, of Waterville, Me., that the closing of the city agency for the sale of alcoholic liquors was a failure and he urged that means should be taken to reopen it. He said that there is a legitimate demand for alcoholic liquors for medicinal uses among all classes and the closing of the only means through which these could be obtained has worked harm, inasmuch as they are obtained for illegal purposes by underhand ways. The number of arrests for drunkenness have not materially decreased. The Mayor recommended a $50,000 high school. A park system should also be started and all work on the streets should be of a permanent character. The Fire Department should be kept up to the highest point of efficiency at all times.

THE REGULATION OF BARBER SHOPS

Barbers of Many States Leaders in Efforts to Secure Sanitary Regulations—Beneficial Results—The Dangers of Non-Regulation

*By W. E. Hart, M.D.**

Concerning the regulation of barber shops, very little, if any information, can be found in recent text books on hygiene. The subject, however, in response to public demand, has, of late, received considerable discussion, through the medium of the press, medical journals, boards of health, and state legislatures.

Progress is slow, but satisfactory to those interested in preventative medicine. There seems no longer any doubt that certain diseases of the skin and scalp can be propagated by the hands and instruments of barbers.

The impression is quite general that contagion in barber shops is principally found on the edge of razors. Contagion is much more apt to lurk in and around combs, brushes, clippers, and the finger nails of the barber.

The most frequent of diseases communicated in a barber shop is the disease commonly spoken of as barbers' itch. Barbers' itch is a more common name for ring-worm of the beard.

Dreadful Dangers in Barber Shop Contagion

Of all diseases propagated in barber shops, none are to be so feared as syphilis. Not long since, a case of this dreadful disease was presented before the Cleveland Medical Society, contracted in a barber shop, by the use of alum stick upon a cut surface. The barber in his work had cut the cheek of his customer, and in stopping the blood had used a piece of alum stick, with the above result.

Bearing on this point, I wish to quote a few lines from a medical gentleman to whom I had written for certain data upon this subject. He says: "I take the liberty of adding a fact of which I am cognizant. A friend of mine now deceased, but during his life a prominent physician, was in a barber's chair, at a resort, when the barber, after shaving him, took out a piece of borax from his pocket to place upon an abraded surface upon his cheek. The doctor noticed in the next chair a man whom he had previously treated for syphilis, and realized the danger that might ensue to him by the application of anything which might have been placed upon a customer suffering from specific disease. The doctor also noticed in the same establishment another patient of his whom he had treated for some obstinate cutaneous disease."

Satisfied, then, of the existing contagion in barber shops, what are the remedies? *In brief, the whole subject can be summed up in one word, cleanliness.*

In the accomplishment of this end we must: First, Educate the barber; second, Protect the barber by suitable legislation; third, Agitate and enforce the rules and regulations recommended by the different boards of health.

Educate the barber to be clean, not only clean himself, but clean in every detail of his work, and in all appliances used by the craft, and there will be very few cases of barbers' itch, or syphilis, propagated by him.

To say that under these circumstances it would be impossible to spread any contagious or infectious disease, would be as absurd as to say that a skilled surgeon, with the best known technique, would never have a poor result following his operations. The reverse may sometimes be true. So with the barber; but the rule that holds good in surgery will hold good in barber shops: the nearer you attain perfect cleanliness, other things being equal, the better your results.

Barbers Want a Reform

It is worthy of mention that as an outgrowth of discussion, formations of unions, etc., there is, on the part of the better class of barbers, a more determined purpose to keep clean. Recently the barbers of Chicago assembled, formed a union, raised prices, and petitioned to be placed under the protection of the City Health Department. They desired to do away with Sunday work and lessen the chances for the spread of contagion by abolishing the five-cent shop. Their action is commendable and a step in the right direction.

At the present time the barbers themselves are very active. Through their efforts, many States have what is termed sanitary laws "regulating barbering," also called barbers' license law. The Governor appoints three members, all barbers, who serve from one to three years respectively, meet three or four times a year, and have appointed days for the examination of barbers. No alien is allowed an examination, and no barber shall receive a certificate who is in the habit of using intoxicating liquors to excess.

In suggesting a few regulations for barber shops, I do not wish to take any advanced ground, but rather select a few of the already well-tried rules which, if followed, would greatly decrease the spread of contagion.

First of all, no shop should be operated without convenient running hot water service. Many shops now have individual bowls for each chair with running hot and cold water. Razors, scissors and clippers, dipped in hot water, are soon made sterile, and the cutting edge is not impaired on account of the heat. Nine-tenths of all the diseases communicated in barber shops can be prevented by the proper use of hot water.

Until within a few years the production of hot water has been a great problem to the barber. Many successful water heaters are now on the market, and their use is absolutely indispensable to any shop endeavoring to do sanitary work.

After considerable deliberation the recently established State Board of Examiners for Barbers have decided upon the following for barber shops in Missouri:

The shops must be scrubbed with hot water and lye every night.

The razors, clippers and scissors, dipped in a 10 per cent. solution of formaldehyde, after each use, and the hands cleansed.

* Health Officer of Elyria O. This is a digest of a paper read before the members of the State and local boards of health of Ohio. It contains many sensible suggestions and food for thought by chief executives and legislators of municipalities.—[Editor.

Sponges and powder puffs are forbidden, and special disinfection is ordered after operating on any person who has any eruption of the face or scalp.

No mention is made of running hot water, the most important item of all. Perhaps the Board thought such an order too drastic to be enforced.

Regulations in Boston

At a meeting of the Board of Health of Boston in 1900, the following regulations were adopted, and posted in all the city barber shops:

"The place of business, together with all furniture, shall be kept at all times in a cleanly condition.

"Mugs, shaving brushes and razors shall be sterilized by immersion in boiling water after every use thereof.

"A separate clean towel shall be used for each person.

"Alum or other material used to stop the flow of blood, shall be so used only in powdered form, and applied on a towel.

"The use of powder puffs is prohibited.

"The use of sponges is prohibited.

"The barber shall cleanse his hands thoroughly immediately after serving every customer.

"No person shall be allowed to use any barber shop as a dormitory.

"Every barber shop shall be provided with running hot and cold water."

Concerning these regulations, the Health Officer of Boston writes: "That it forms more of an entering wedge than a complete treatment of the case, as a more complete treatment involves questions of reasonable demands, and power to enforce them."

Every barber shop should have in addition to running hot water some other method for the more thorough disinfection of tools. Many antiseptics injure the cutting edge of instruments. Prof. Koch was the first to discover that soap added to boiling water increased the germicidal effect, and was harmless to instruments. It was later shown that this was due to the alkalinity of the soap; therefore, it was found that a solution of carbonate of potash (one per cent.) answered the same purpose.

Neat and convenient sterilizers are now made with compartments for brushes, towels, instruments, etc. Modern sterilizers are not costly, and any barber using them will not only increase his trade in numbers, but desirability of patrons as well.

One way to guard against infection from brushes is to do away with their use entirely. This would suit a large number of customers. Shaving brushes can be disinfected by being placed in boiling water for five minutes before using, or better still, dispense with their use, substituting a puff of cotton which can be destroyed after one using. Customers should be encouraged to own their own instruments, razors, soap, brushes, etc., and this made compulsory of sick customers, or any one suffering from any disease of the skin, scalp or hair. Barbers should encourage sick customers to have work done at their own homes. For operations on dead bodies, the barber should have instruments used only for that purpose.

Already mention has been made of the purification of the hands. Special attention should be given to the finger nails of the barber. The alum stick and brushes should be placed upon the retired list, where powder puffs and sponges now are. Vaseline, if used at all, should not be used in common with fellow workmen. When used, a spatula or spoon, not the fingers, should be inserted into the bottle, and care exercised in not allowing the spatula or spoon to come in contact with the possibly contaminated hands.

Any barber shop will be more complete with some kind of a closet, where combs, brushes, clippers, etc., can be placed when not in use, so that they can be exposed to the fumes of formaldehyde.

A prosperous Detroit barber, for years proprietor of an up-to-date shop, has invented and now manufactures a neat cabinet properly named "antiseptic." The cabinet is made of solid oak, contains three drawers, one for combs, brushes, soaps, mugs, etc., another for scissors, razors and clippers. The other drawer in the rear for formaldehyde. The cabinet is so arranged that when opened the fumes are shut off. No better antiseptic sign can be displayed in any barber shop.

Many more rules could within the time limit of this paper be suggested. The purpose, however, has been to call your attention only to the fundamental principles of hygiene of the barber shop and invite voluntary action on the part of our barbers rather than make imperative the adoption of any rules and regulations. Perhaps enough has been said to convince the most skeptical that this subject has been and will be for some time in the minds of all good citizens interested in the prevention of diseases.

Courtesy, Merchants' Asso. Review.

VIEW OF HARBOR OF SAN FRANCISCO

THE WATER WASTE PROBLEM

New York Has a Daily Fixture Leakage of 44,000,000 Gallons, as Shown by the Pitometer —Description of Methods Used

By Edward S. Cole

THE recent investigations of water waste in New York City afford an excellent illustration of the general method outlined in my previous article on this subject. The results have not only been of great value to the city, but have furnished much new light on the use and waste of water, which should be of interest to all municipalities.

A brief account of these studies is here presented, giving some idea of the general results, and the method by which they were obtained. A more complete analysis, however, may be found in the reports of Chief Engineer, N. S. Hill, Jr., of the Department of Water Supply, Gas and Electricity, New York City, and in the report of the New York Commission on Additional Supply, 1903.

THE PRACTICAL USE OF THE PITOMETER DEMONSTRATED

These investigations were begun in the fall of 1902, and continued for about a year, using pitometer gaugings of supply as a basis. The pitometer, as described in the March issue of the MUNICIPAL JOURNAL AND ENGINEER, has given a new impetus to water waste detection, for, with its use, it is now a simple matter to measure and record the flow of water in an underground pipe. Starting with this as a basis, it is only necessary by closing the regular main gates to isolate portions of a distribution system, allowing the supply to come in at one or more points where the flow must, of course, be recorded. The enclosed area may be half a mile square, or may consist of a single block; in either case its total supply is found, and, by comparison with the population and the special requirements of the section, we may judge of its wastefulness.

By sub-dividing this area, we pick out small sub-sections or single blocks which have an abnormal rate of supply, as shown by the pitometer. In New York, unfortunately, we found it impossible to fully localize the waste indicated in some districts because of the lack of service cocks. However, the charts showing variations in total supply are highly instructive and valuable.

In the organization of this work, it was necessary to obtain statistics of population by U. S. enumeration districts from Washington, and the figures for frontage and metered revenue from the books of the Water Department, also data regarding the number of houses and families in each of our pitometer districts. A force of house to house inspectors was organized for the purpose of measuring, as far as possible, the visible leakage in plumbing fixtures throughout our districts. These men also measured and inspected roof-tanks, the filling and overflowing of which had an important bearing on our results.

METHODS OF INVESTIGATION

The pitometer force required the use of one of the regular Water Department repair gangs for the work of setting the wooden street "boxes" in position over such supply mains as each district required. These boxes were about four feet on an edge with hinged cover set directly upon the main so as to give access to a standard one-inch corporation cock previously located by means of the regular tapping machine. Through this cock the pitometer enters the main, and the flow of water is measured as before described.

These test boxes were often maintained for a week or two in narrow streets with little trouble from heavy traffic. The supply to each pitometer district was under continuous measurement for about one week, after which the boxes were removed from the streets to be reset in another part of the city.

In this way twelve large districts comprising altogether 1,438 acres in Manhattan, and 434 acres in the Bronx were investigated. Some of the principal results are shown in

SUMMARY OF WASTE INSPECTION, DEPARTMENT OF WATER SUPPLY, GAS AND ELECTRICITY OF THE CITY OF NEW YORK

1	2	3		4	5		6		7	8	9	10	11	12
No. of Waste Dist.	Total Acres in Borough. 100 P. C.	Area Waste District. Acres.	P. C.	Total Consumption Daily by Pitometer Tests. 100 P. C.	Metered Daily. Gallons.	P. C.	Leakage in Fixtures. Gallons.	P. C.	Population. Resident.	Total.	Gross per Capita Consumption. Resident.	Total.	Total Revenue M Gals. Approx.	Total Rev. Met'd & Unmet'd Gallons. Yearly.
					Borough of Manhattan									
1		127		1,470,000	638,000	43	42,429	3	8,396	12,156	175	121	$.0720	$49,115
2		70		1,440,000	293,000	20	369,000	26	38,906	38,906	37	37	.0988	51,865
3		168		5,400,000	940,000	17	672,500	12	90,000	90,000	60	60	.0498	98,485
6		58		760,000	160,500	21	87,200	11	10,164	10,164	74.8	74.8	.0697	19,300
8		230		9,450,000	5,379,000	56	423,764	5	11,000	114,000	860	83	.0778	269,131
9		75		1,366,000	156,300	11	119,500	9	8,872	8,872	154	154	.0520	25,895
10		310		20,203,000	1,838,000	9.08	1,217,000	6	218,000	218,000	92.7	92.7	.0257	189,763
11		196		4,888,000	364,000	7.4	1,100,000	22.5	43,800	43,800	111.6	111.6	.0539	96,251
12		204		2,750,000	977,000	35.5	697,000	25.2	40,000	40,000	68.5	68.5	.0866	87,019
Total	12,576	1,438	11.4	47,727,000	10,745,800	22.4	4,728,393	9.9	469,138	575,898	101.7	83.2	$.0566	$886,824
					Borough of The Bronx									
5		174		1,730,000	86,000	4.9	329,479	18.8	32,200	32,450	54.3	54	$.0674	$43,023
7		260		1,543,000	776,900	50.4	125,646	8.1	3,076	6,076	502	256	.0742	41,768
Total	26,522	434		3,273,000	862,900	26.2	455,125	13.8	35,276	38,526	93.5	85.6	$.0706	$84,791
					Total for Boroughs of Manhattan and The Bronx									
Total	39,098	1,872		51,000,000	11,608,700		5,183,518		504,414	614,424	101.1	83.2	$.0521	$971,615

Estimated Total Plumbing Leakage

Manhattan—4,728,393 gals. is 11.4 per cent. of 41,500,000 gals. per diem, which, at meter rate = $2,020,000 per annum.
The Bronx—Estimate based on pop. as above.. 2,710,000 gals. per diem, which, at meter rate = 132,000 per annum.
Total Estimated Leakage, Man. and The Bronx 44,210,000 gals. per diem, which, at meter rate = $2,152,000 per annum.

the brief summary herewith, in connection with which it is interesting to note that district Nos. 1, 6 and 9 are high class residential areas, Nos. 2, 3 and 10 are typical tenement house sections, Nos. 5, 11 and 12 contain moderate priced flat buildings, while Nos. 7 and 8 are devoted largely to business and manufacturing.

It is instructive to notice the variation in per capita supply as shown in columns 9 and 10. The effect of transient population in office buildings is well shown in district No. 8, also in district No. 1 which has a comparatively large floating population in hotels and stores.

Perhaps the most interesting results are given in column No. 11 in which appears the gross revenue per 1,000 gallons actually supplied to each district. Here we see a wide variation and singularly enough, the lowest average revenue about 2½ cents and the highest, about 10 cents, are both paid in tenement house districts, Nos. 10 and 2 respectively. A comparison of this showing with the regular meter rate of the department which is 13 1-3 cents per 1,000 gallons, is quite suggestive.

In a recent State report of Mr. Dexter Brackett, C. E., which sets forth the results of metering the supply of various towns in the vicinity of Boston, there is additional proof of a great loss of water even in metered communities. We now have on record many instances where from 30 to 50 per cent. of the total supply is *unaccounted for* in cities, which are nevertheless almost entirely metered.

The Pitometer as a Reliable Detective

In district No. 8 of our New York summary it will be seen that, with a supply of nearly ten million gallons daily, the meters account for *only 50 per cent!* This district is the office building and business section of lower Manhattan, where meters are supposed to be in very general use. This astonishing state of affairs is unfortunately not uncommon, as has been found by district tests made with the pitometer in several cities. The cause of this discrepancy is undoubtedly due to illegal use through unmetered fire connections, or bye-passes, and to underground leakage. For these the recent measurements of total supply in various cities have afforded the strongest evidence.

In assigning these chief causes it is, of course, assumed that the main supply is correctly measured, which, by the way, often is not, for lack of information regarding "slippage" at the pumps. The ordinary house meter as is well known, is not chargeable with any large part of these great discrepancies, and we are therefore left to the conclusions given.

Careful attention should be given to the column in our summary showing the amount of visible fixture leakage measured by the house to house inspectors. Considering the poor condition of much of the plumbing in New York, it is remarkable that only 10 per cent. of the total supply was found. This rate indicates a total fixture leakage for the city of about 44,000,000 gallons daily, an item well worth saving.

STREETS, ALLEYS AND BOULEVARDS*

Narrower Roadways and More Space between Curb and Sidewalk Desirable—Conditions in the Smaller Minnesota Municipalities

By Carlos Avery

THE field of effort to which the Committee on Streets, Alleys and Boulevards is confined might seem unimportant in comparison with that of some of the others; such as, the committees on Railroad Rates, Municipal Charters, Public Service Corporations, etc., yet could the amount of money which is annually wasted in unsystematic, senseless, extravagant methods of street work be accurately estimated the figures would be startling.

In many otherwise progressive and modern small cities the most primitive methods of street making still prevail. The archaic graft inducing poll tax and road tax, relics of the days of barter, prevalent in the pioneer days in the backwoods districts, are still in vogue in many communities. The "road boss," elected by the people, uses his little brief authority to parcel out the street jobs among his followers so as to insure his own re-election. Streets are "worked" one season only to be torn up and worked over again a year or two later by a succeeding administration, with different ideas of street grading, and another crop of camp followers clamors for the loaves and fishes.

Again, as a general rule, in these rapidly growing western towns, there is no recognized rational standard of street making. There is no conception of what is required to make a beautiful residence street, and worse than all, there seem to be a great deal of apathy and indifference. The average village street in this State, compared to those of New England, for example, is a disgrace and a reproach upon our western civilization. Wide grades extending from sidewalk to sidewalk which grew up to weeds, catching dust, litter and disease, producing filth, are the general rule. Parking or boulevarding of residence streets is all but unknown as yet.

There are, of course, exceptions to the general rule, but the general condition calls for education and agitation. Our people are alert and capable of civic pride. Once their interest is aroused and some one points the way, a transformation can be accomplished.

We have become so accustomed to rough and dirty streets, broken sidewalks, illkept lawns, neglected cemeteries, school grounds and public property; to the dumping of ashes, tin cans and all manner of garbage in the public streets, that we have grown indifferent. What we need is a revival in civic pride.

First Step in Planing Streets

The first essential in providing for permanent street work is, of course, the arrangement and establishment of street grades. This should be done in every growing town or city

* A digest of a report on "Streets, Alleys and Boulevards," by Mr. Carlos Avery, chairman of the special committee of the Minnesota Municipal and Commercial League, presented at the annual convention, St. Paul, Feb. 17 and 18, 1904.—[EDITOR.

before the erection of costly buildings renders the establishment of correct grades a difficult matter.

In laying permanent walks, constructing sewers, or paving streets, the question of grade is forced to the front and wise is the community which has provided against the future, by having a system of grades carefully worked out by a competent engineer and profiles made and recorded.

The work should not be done piecemeal for a few blocks or a street or two at a time, merely to tide over the difficulty for the time being, but should be carefully done for the whole corporation at one time, insuring a system that will provide good drainage as well as beauty of streets and abutting property. Property owners invariably fight cuts and fills to the bitter end yet in nine cases out of ten when the work is finished, some simple terracing will give a fine appearance to lots the owners believed irretrievably ruined.

It should not, however, be understood that straight lines or geometrical regularity are to be aimed at. On the contrary they should be avoided as far as possible and at the same time secure perfect drainage.

Roadway Should Be Narrower

This committee has made some inquiry along the line of street grading, particularly as to the width of roadway, and the information collected in the following table only goes to show that practically all towns are making their roadways too wide:

Name of Place.	Pop.	Width of Street in ft.	Width of Roadway in ft.	Distance of tree line lot in ft.
Belle Plaine	1,400	80 to 100	50 to 70	8 to 10
East Grand Forks	2,500	66 to 80	32 to 54	8
Olivia	1,200	80	50 to 80	8
Madelia	1,700	60 to 66	50 to 60	
Hawley	600	80	65	6
River Falls	3,000	80		
Pipestone	3,000	80		10
Hutchinson	3,000	82½	42½ to 50½	12
New Auburn	300	66	40	10
Mankato	10,599	40 to 100	30 to 70	
Wheaton	1,132	66	50	
Melrose	2,000	60 to 80	40	
Montevideo	2,500	60 to 80	60 to 60½	10
Buffalo	1,200	60	42 to 44	
Stewartville	830	Various		
Proctosknett	700			
Campbell	350	50		
Beardsley	500	60 to 100	12 to 84	8
Ortonville	1,800	66	50	12 to curb
Minneota	900	80	30 to 55	
Howard Lake	900	66		8 to 9
Cannon Falls	1,500	80	30 to 55	
Waconia	800	66 to 80		8
Ashly	350	70 to 66		
Waseca	3,200	66	38	
Chatfield	1,700			
Elysian	500	80		8
Echo	450	80		12
Morton	900	60		
Winona	20,000	70 to 100	50	12

This matter of width of roadway has received considerable attention in the past year or two and the sentiment in favor of the narrower width with wider parking space on the sides has become very favorable, and a great many towns are already taking up the reform.

It would seem that the proposition needs no demonstration, that there is no sense in spreading gravel or other more expensive surfacing material over two or three times as much width as is acutally traveled.

While no definite figures can be here given, it is, without much question, a fact that a 30-foot roadway can be built for about one-third the cost of one sixty feet wide and is ample for all traffic on all except principal business streets.

Every effort to narrow the roadway, as all know who have tried it, is met with all manner of objections, being that it is impossible for a load of hay to turn around on a 30- or 40-foot roadway without driving around the block.

Narrow Driveways Can Be Made More Attractive

An interview by a gentleman well informed in such matters recently published, gives the arguments very well. He says: "It seems to be the tendency at the present time in cities with the most advanced ideas to narrow the portion of the public street which is used for the passing of vehicles. My attention was especially called to this when, upon a visit to Winnipeg a few weeks ago, in driving about the residence portion of the city, I was struck by the attractive appearance of the streets and especially the excellent effect produced by broad boulevards and narrow paved portion. I was so interested that I stopped and measured the width between curbs and was somewhat surprised to find it only twenty-four feet. Many of the residence streets also are paved with asphalt, some of which has been in use five years, and all of which seems to be in excellent condition.

"Shortly afterward I visited Chicago and measured some of the best resident streets of that city. I found the tendency there also to be in the same direction, that is, toward wider boulevards and narrower paved portions. Portland avenue in St. Paul, a handsome street paved with asphalt, is thirty-four feet between the curbs.

"I am informed that all residence streets in Toronto are also treated in this manner. Mr. Warren H. Manning, the eminent landscrape architect of Boston, favors paving of streets not more than twenty feet wide. It seems to be the consensus of opinion of those best informed that the paved portion of a resident street, even if it is a thoroughfare, ought not to be more than thirty-four feet in width. There is absolutely no reason for cross streets having paving more than twenty feet wide. It would seem self-evident that a greensward is more attractive than a dusty pavement. I do not believe in narrow streets, but I do believe in narrow driveways.

"The advantages are many: First, in the item of first cost; second, cost of maintenance; third, better lighted streets, as the street lamps are brought out from under the shadow of the trees and placed at the outer edge of the curbing; fourth, no occasion for tearing up paving when necessary to change water mains, gas mains or electric light conduits, as these will be placed inside of the curbing; fifth, it practically deepens the residence lot the number of feet that the paving is reduced; sixth, for sanitary reasons, it needs no argument to show that every foot of pavement which is reduced and added to the greensward of the city tends to better sanitary conditions."

The material most suitable for surfacing streets in small towns is gravel, when obtainable, of course, and will, with occasional repairs, answer for all ordinary traffic. For the larger town, crushed stone surfacing or brick pacing becomes necessary on streets bearing the heaviest traffic.

This committee recommends that literature should be prepared and distributed to municipal authorities, commercial bodies and to the press throughout the State, illustrating and setting forth the arguments in favor of a more rational economical and artistic system of street making. The formation of local and neighborhood improvement associations through which to carry on the campaign of education should also be encouraged and promoted.

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Private Lighting More Expensive than Municipal

THE Mayor of Chattanooga has been making some interesting comparisons of the cost of lighting in cities which buy their light from private companies and those which own and operate their own plants. In a recent interview he drew attention to the contrast afforded by the low cost, per arc lamp, at which Nashville is lighted as compared with the much higher price paid by his own city. The former is a municipal plant and the latter is owned by a private company.

Chattanooga pays $85 per arc lamp while the same service costs Nashville a trifle less than $50, making a difference in favor of Nashville of $35 per arc lamp. Some months ago we printed an account of the successful operation of the municipal plant at Nashville, but our readers will be interested in the statement of former Mayor Head, of Nashville, recently made to Mayor Chambliss of Chattanooga, as follows:

"The total cost for lighting the city under the contract system had for several years been about $49,000 per annum, and the actual cash paid by the city for lighting the streets and public buildings for the year 1901 was $47,302.75. This gave to the city 382 arc lights, the outages and inefficiencies of which kept the city in a constant broil with the company on the one hand, and with the citizens on the other.

"On October 1 the city accepted from its contractors its newly constructed electric plant at a cost of $140,063.73, which included the cost of the site and the building. Additions were gradually made until the total cost had run up to $153,980.66.

"The actual cost of operating this plant for twelve months has been $35,162.96, which includes interest on bonds, betterment, etc. This is for 630 arc lights and 1,961 incandescent, as against the 382 previously furnished. The total expense of operating the municipal plant from October 1, 1902, to October 1, 1903, was $35,162.96. Had the light now being furnished to the city been supplied by the private company under the contract in force at the time the city took charge of its own lighting, it would have cost the city on a basis of the present number equal to 822 arc lights, $69,870, or $22,567.25 per year more than the city was paying in 1901, before it built its plant, and $34,707.04 more than it costs now.

"After the city had finally decided to construct this plant, the private company, which was then charging its customers 18 cents per kilowatt, before the foundations for the city's plant were completed, voluntarily reduced its price to private consumers from 18 to 12 cents per kilowatt, and contracts are now being made with the private company for a term of years at 5 cents per kilowatt.

"The actual cost to the city, using its own plant, for producing electricity during the past twelve months has been 2.65 cents per kilowatt."

Alliance of Civic Organizations

THERE is another civic organization in the field, all-inclusive in its scope, the "Alliance of Civic Organizations." Its membership is confined to "associations having for an object the improvement of political, educational, artistic, sanitary, material or moral conditions in American cities." Its work will be that of a general supervisor, or advisor, to its auxiliary members, which number only six at present, as follows:

National Municipal League, with Charles Richardson, Philadelphia, William P. Bancroft, Wilmington, Del., and Clinton Rogers Woodruff, Philadelphia, as trustees, authorized to represent the League in the deliberations of the Alliance; League of American Municipalities, with Hon. John MacVicar, Des Moines, Ia., William S. Crandall, New York, Hon. J. M. Head, Nashville, Tenn., as trustees; Conference of Eastern Public Education Associations, with Mrs. William M. Ellicott, Baltimore, D. C. Heath, Boston, Mrs. William E. D. Scott, Princeton, N. J., as trustees; American Park and Outdoor Art Association, with Warren H. Manning, Boston, Charles Mulford Robinson, Rochester, N. Y., Mrs. Charles F. Millspaugh, Chicago, as trustees; American League of Civic Improvement, with J. Horace McFarland, Harrisburg, Pa., Charles Zueblin, and Frank Chapin Bray, Chicago, as trustees; Architectural League of America, F. S. Lamb, H. K. Bush-Brown and J. F. Harder, New York, as trustees.

The purpose of this Alliance is "to facilitate an exchange, accumulation, and distribution of pertinent information, to promote a more complete understanding and co-operation among its members, and to assist them in increasing their influence and efficiency, and avoiding any unnecessary duplication or overlapping of their respective lines of work."

Although the promoters of the Alliance are the leaders in several of the auxiliary members there need be no fear that there will be any partiality shown, as the leaders in the Al-

liance movement are too broadminded and just, besides having the development of the whole field too much at heart, in the administration of the affairs of the Alliance. There is every prospect that every member will be made equally prosperous and that the whole field will be better taken care of and developed than could be hoped for under the old condition. For these reasons it is hoped that every national organization, elligible to membership, will come into the Alliance.

The Alliance is to be controlled and directed by trustees who shall be elected or appointed by the auxiliary organizations. As stated by the Constitution of the Alliance the duties of the trustees shall be as follows:

"To appoint a secretary and such other officers and assistants, with such duties and on such terms and conditions as they may from time to time think expedient.

"To raise funds and incur such expenses as they may find necessary, *provided always* that no expense shall be incurred in excess of cash on hand or reliably secured, and that in no case shall there be any pecuniary liability or responsibility on the part of any of the constituent organizations.

"To admit other national or general organizations to membership.

"To admit local associations and individuals as associate or contributing members or subscribers, but no such local associations or individuals, as such, shall have any voting or governing powers, or shall be liable for any sum which they have not expressly subscribed for or agreed to pay.

"To arrange that the secretary shall obtain reports and information from each association for transmission to the members, in full or in the form of abstracts or summaries, in typewritten or printed communications or bulletins; and that he shall also prepare and furnish, for general publication, such information as may accord with and promote the purpose of the Alliance.

"To make from time to time, directly or through the secretary, such suggestions as they may think important for promoting the work or objects of the respective associations.

"To change these By-laws or make new ones by a verbal or written vote of three-fourths of the trustees; provided that no such change or new By-law shall impose any pecuniary liability on any associations or individuals without its or their formal and clearly expressed consent.

"The Constitution also provides that, "There shall not be at any time the slightest interference with or control over the action or management of any association, and no views or action shall be imputed to any association or expressed in its behalf, except as the same may have been clearly authorized by its own act or the approval of its proper officers."

Akron Says Wires Must Go Underground

THE Council of Akron, at a recent session, appointed a committee to draft an ordinance compelling all wires to be placed underground. At present, wires of both high and low currents are carried on the same poles, a practice which has already caused the death of three people within the past two years. It is time that some action of the sort were taken and it is to be hoped that a suitable ordinance may be enacted and enforced immediately. There are many other municipalities which need to take the same action.

Road Appropriation Vetoed

GOVERNOR MURPHY, of New Jersey, vetoed the improved roads appropriation of $275,000, because that sum, in his judgment, was too large. He thought $250,000 was quite sufficient to be devoted to that work. Favoring the more rapid improvement of the public highways, as we do, we cannot look upon this official act of the governor of New Jersey otherwise than as a blunder. New Jersey was the leader in the good roads movement and has, under the wise administration of Commissioner Budd, gained an enviable reputation. The appropriation should have been not less than $300,000 and to make it only $250,000 is a step backward.

Eliminate the Smoke Nuisance

WITH the coming of the summer months the soft coal nuisance will become more unendurable. In cold weather people spend most of the time within doors, where the soot pest is least noticeable, but now that milder breezes are blowing, windows and doors will be left open to receive the floating specks from the soot laden air. Delicate fabrics, dresses, furniture, carpets and the like, will be greatly damaged or ruined. The remedy for this evil may be found in an ordinance compelling the manufacturer to follow either one of two courses: First, the use of hard coal; or second, the use of some smoke prevention device where soft coal is used. There are patent stokers, down draft and specially designed furnaces which have demonstrated their efficiency in minimizing the evil and their use should be made mandatory wherever they may be required. Stringent regulations are enforced in New York and a few other cities and without embarrassment to the manufacturer, and, as one result, their citizens enjoy a clear atmosphere all the year through. Now is the time for the progressive mayors and aldermen to "get busy" and pass an ordinance which will be a lasting benefit to their city.

Rapid Growth of Acetylene Gas Lighting

IT is no longer necessary for the small town to give away valuable lighting franchises as an inducement to some private company to install an expensive gas or electric lighting plant; it can light its own streets at a comparatively slight cost and own and operate its own plant with a moderate outlay of capital. This has been made possible by several methods of illumination, but none has made more rapid progress than the acetylene gas lighting system. In 1898, the first four plants were installed; the following year four more were added to the list, and during the four succeeding years, ten, twenty-one, twenty-one, and sixty-one plants were installed respectively, making a total of one hundred and twenty-two plants. That this is a system of lighting to be relied upon, that it is economical and satisfactory in every way is attested to by the towns that have had the experience. The towns that have used it the longest have the most to say in its praise. As installed for town lighting, there is less danger than in the use of either common gas or electricity, and the expense involved is much less. The advent of this new system of town lighting may be looked upon as a boon to the smaller municipalities.

World's Fair Good Roads Meeting

THE National Good Roads Association has called a meeting to be held at St. Louis, May 16th to 21st inclusive, to which all of the friends of the good roads movement are cordially invited. Everyone will be welcome, but if you want an official invitation send your name and address to us and we will see that one is mailed to you. If you want any of your friends invited, in any part of the world, send their addresses also and invitations will be sent to them. The Louisiana Purchase Exposition has designated May 19th as "Good Roads Day."

Favors More Expensive Pavements

WE have always been in favor of the high priced pavement because we believe it would give better service and really be less expensive than a cheaply laid pavement. Many cities are coming around to our way of thinking as they acquire a larger experience. Among the latest converts to the better way of laying pavement is Toledo, which is due to a recent trip of its Board of Public Service to Cleveland and to Indianapolis. In voicing the sentiment of the Board the president, Mr. John Stollberg, said:

"What we have seen in other cities convinces us that there is no necessity for this constant repaving of streets, where the work was done only a few years ago. The trouble with Toledo has been that it has always been afraid to lay the best class of pavements on account of the comparatively high first cost. There has been no eye for the fact that it is much more economical, in the long run, to have the best pavement and thus avoid the necessity of repaving, almost as soon as the guaranty runs out."

No More Macadam for Atlantic City

ONE of the councilmen of Atlantic City declares that he will never vote again for macadam pavement for city use. He says that macadam would answer the purpose of a country road, or of a small town or village, but when it is proposed to build any more macadam roadways in Atlantic City he will oppose it. When interviewed upon the subject he said: "What we need here is either brick, bitulithic or asphalt streets. The time is ripe when such improvements should be made of a permanent character. On streets that are likely to be torn up a great deal it might be well to pave with brick, or bitulithic, as either kind is easily repaired and will look none the worse after being disturbed. It would be more difficult to make asphalt look as well as when first laid. But when we improve any more of our streets we want something good and something that will last." This councilman is taking the right stand and it will be a fortunate thing for Atlantic City if it is able to carry out such sensible ideas.

Government Railways in New Zealand

NEW ZEALAND has been called the "Britain of the Southern Seas," and she is sufficiently progressive along all lines to be worthy of the name. This Island Empire owns and operates all of its railways with the exception of a short line, known as the Wellington and Manawatu Railway, and as compared with Government administration, the private line is less successful. The Government has a total of 2,291 miles of track open for traffic, the total cost of which aggregates $95,408,675. The gross earnings in 1903 amounted to $9,870,190, while the net profit amounted to $3,153,115. Ordinary passengers carried, 7,575,390; season tickets sold, 118,431; general merchandise tonnage, 3,730,394; live stock tonnage, 187,867. The Railway system is equipped with 372 locomotives, 751 passenger cars and 12,992 wagons or what we call freight cars. It is impossible to make a comparison with the American railways for the reason that the latter will not tell how much water there is in their stock nor give other figures which would be essential to such a comparison. But it is safe to assume that New Zealand would not suffer from a fair comparison.

Personalities

—Mayor Joseph Riordan was re-elected mayor of Harrison, N. J.

—Mr. George P. Wright has been elected mayor of Tacoma, Wash.

—Mr. Thomas Hoctor will be the next mayor of South Omaha, Neb.

—Mr. Milton D. Porter was elected town clerk of Swampscott, Mass.

—Mr. Robert Hooke has been re-appointed to the position of city engineer of Chattanooga, Tenn.

—Mr. J. H. Neff, Republican, has been elected mayor of Kansas City, Mo., defeating Mayor James Reed.

—Mayor David S. Rose, of Milwaukee, Wis., has been re-elected for the fourth term as mayor of that city.

—Judge William F. Henney has been elected mayor of Hartford, Conn., defeating Mayor Ignatius A. Sullivan.

—Mayor Helmbold of Newport, Ky., is pushing the proposition of a municipal electric lighting plant for that city.

—Mrs. A. W. McLellan has been appointed a park commissioner of New Orleans, La., being the first woman to hold such an office there.

—Hon. J. Emil Johnson has been re-elected mayor of Jamestown, N. Y., by a substantial majority. Mr. Johnson's former administrations have been most successful.

—Mr. C. N. O'Hare has been elected mayor of Superior, Wis., and Messrs. J. J. Surch and R. L. Hunter were chosen respectively comptroller and treasurer of the city.

—The Councils of Erie, Pa., elected Mr. H. C. Lord president of the Select and Mr. James B. Yard president of the Common branch. City Clerk Hanlon was re-elected.

—Mayoralty elections in Missouri resulted as follows: St. Joseph, W. E. Spratt; Mexico, Eugene E. Jones; Macon, John T. Gellham; Webster Grove, Ed. S. Hart; Unionville, Z. T. Shearer.

—Mr. Fred W. Clair has been elected City Clerk of Waterville, Me., by the Council of that city. Mr. Jesse Stinson was chosen city treasurer, Mr. Norman K. Fuller, city solicitor, and Mr. Dennis E. Bowman, city auditor.

—Mr. David Heinsedman of the Board of Public Service of Youngstown, O., is determined that all water used for the street flushing machines must be paid for. He said that the water-works was not a charitable institution and was supported by the water users exclusively.

—City Anditor Durand of Akron, O., has a plan to solve the lighting problem by making assessments for lights where

there are such, instead of paying for them out of a general tax. They should be treated in the same way paving is paid for, by assessing the benefited property. This would make lighting a special assessment.

—Mayor William H. Gass, of Knoxville, Tenn., in carrying out his pre-election promise to enforce all the laws, whether good or bad, has had occasion, it is reported, to call the members of the Board of Public Works to order to impress on them that he means business. He has said that if laws are bad it is only necessary to repeal them to be rid of them, but as they stand they must be enforced.

—The results of Texas elections for mayor were as follows: Dallas, Hon. Bryan T. Barry; Denison, Dr. A. W. Acheson; Texarkana, A. C. Stuart; Waco, James B. Baker; Alvarado, W. H. Goldsmith; San Angelo, C. H. Powell; Nacogdoches, R. T. Shindler; Temple, Fred P. Mamill, Hillsboro, Fred Quickenstedt; Taylor, John F. Black; Georgetown, R. E. Ward; Cleburne, Nat F. Higgins; Corpus Christi, H. H. Segrest; Whitewright, William Payne.

—Because of a lack of official records regarding the service of officials of Newark, N. J., Mayor Doremus recommended to Council that the City Clerk be instructed to compile a complete record of all the officials, showing the dates of entering and leaving office, the name of their department, whether they are bonded and to what amount, the salaries they receive and whether they are appointed or elected. The Council so ordered and a roster will be prepared from the year 1836, when the charter was granted the city.

—In vetoing a franchise for lighting to a private company in Dayton, O., Mayor Snyder gave these as his reasons: Because it does not impose underground wire conditions, the same as the telephone companies were compelled to submit to; because the Dayton Electric Light Company has not kept its contract with the city on prices for commercial lighting and power; because a price ordinance does not accompany the grant; because the service is poor and the prices high; because four-fifths of the city cannot get residence light. The Mayor submitted facts and figures to support his statements and stated that the company has no legal contract with the city as it was not until 1886 that the Legislature gave cities the right to grant electric light franchises.

Waste of Water Large in Binghamton

THE Board of Water Commissioners of Binghamton, N. Y., join with the growing army of water-works officials who are continually protesting against the waste of water in their respective cities. In the last report the Binghamton officials stated that a large outlay of money would be necessary to increase the pumping facilities if the waste of water were not checked. The per capita consumption is 145 gallons per day, while in an account of 322 families where meters are used, twenty-four gallons per capita met all requirements. In 1903, 164 meters were put in, making a total of 850 in service.

The filter plant gave good satisfaction during the year, tests showing that 99 per cent. of the bacteria were removed. In 1901 there were 175 cases of typhoid fever, sixty-one cases in 1902 when the filter had been in operation seven months, and but twenty-five cases in 1903. The condition of the river water has been in very bad condition many times, but the filter was able to furnish good water always. Bacteriologist B. E. Nelson, reported that intestinal bacteria were found in the raw water, and once beyond the filters, but temporarily increasing the alum caused them to disappear.

The sum of $108,779.26 was received, while the expenditures amounted to $123,972.13, the large balance at the beginning of the year covering the excess of expenses and giving a balance of over $117,912. The flat rate for one family of six persons is $3, and this amount is also charged for the first closet and the first bath. The rate per 1,000 gallons by meter runs from 16 cents for 1,000 gallons a day, or less, to 6 cents for from 10,000 to 20,000 gallons per day.

cc -breaking Improvements in St. Paul

THE past year broke all previous records for money spent in the City Engineer's department of St. Paul, Minn. City Engineer Rundlett reported the total cost of work done at $1,121,233.72. The total amount spent on sewers was $103,096, paying for 8.7 miles, mainly vitrified pipe. The cost per mile averaged $11,700 including manholes and catchbasins. This makes 193.88 miles of sewers in the city. The sum of $500,000 was recommended for sewers. Paving contracts aggregated $352.138, for which 3.6 miles of asphalt were laid at an average cost of $1.96 per square yard; two miles of sandstone at a cost of $2.69; 2.25 miles of brick at $1.83; and 0.28 miles of granite at $2.75. The city now has 47.44 miles of paving, including 25.42 miles of asphalt, 9.39 of brick, 5.39 of sandstone, and 6.25 of wood. For curbing, Kettle River sandstone was used at a cost of 70 cents per foot and an assessed charge against abutting property of $1 per foot. Concrete curbing was recommended as it would reduce the cost to property owners. An average of 141 miles of streets were sprinkled during the season at an average cost of $276 per mile, fifty-six teams being employed at $90 a month with no reduction for rainy weather.

Convention Dates

MAY

National and International Good Roads Convention will be held at the Exposition, St. Louis, Mo., May 16-21.

AUGUST

The League of Georgia Municipalities will convene at Savannah, Ga., August 10, 1904. Mayor Bailey, secretary, Griffin, Ga.

The National Firemen's Association will hold its annual convention at St. Louis, Mo., August 22-27. D. W. Gillen, secretary, 176 Monroe street, Chicago, Ill.

SEPTEMBER

The annual convention of the International Association of Fire Engineers will be held at Chattanooga, Tenn., September 14-17. Henry A. Hills, secretary, Wyoming, O.

OCTOBER

League of American Municipalities will meet in seventh annual convention at St. Louis, Mo., October 4-6. Hon. John MacVicar, secretary, Des Moines, Ia.

FROM THE MAYORS' VIEWPOINT

What Their Cities Need in Improvements to Paving, Street Cleaning, Water Supply, Fire Apparatus, Etc.

First Annual Mayor's Message in Minneapolis

This message of Mayor J. C. Haynes was the first annual message submitted by any mayor of this city, only inaugural and farewell messages being the custom. Mayor Haynes is of the opinion that it is the duty of the mayor to give at least an annual report such as is transmitted by all departments. The Mayor touched upon the terrible results attending the pumping of impure water when one of the large water mains broke. A large number of typhoid cases and deaths were the inevitable results of this case of misjudgment on the part of the officials. A larger police force was urged, as only 237 men were in the department. A system of public playgrounds is a pressing need. Small tracts of land through the city should be obtained for this purpose. Mayor Haynes called attention the need of an automobile ordinance and to the necessity of pushing through the theater ordinance and one to prevent the sale of dangerous explosives on the Fourth of July. He also urged that the city take advantage of the law permitting cities to establish employment bureaus.

Ten Years' Improvements in East Rutherford, N. J.

In his annual message Mayor McKenzie, of East Rutherford, N. J., reviewed the many improvements since the organization of the borough ten years ago. The Fire Department has been fully equipped, two small parks installed, police protection established, over eleven miles of macadam laid and thirteen miles of grading done. The erection of a fine municipal building has been a factor in the growth of the place, for here is located a free public library and a meeting place for the people. With all the improvements, the debt of the place has not been materially increased, for the policy has been "to pay as you go."

Augusta Schools Should Be Under One Board

The school system of Augusta, Me., is unlike those in the other cities of the State in that only a part of the schools are under the control of the city school board; only the ungraded rural schools are subject to the control of this board. The rest of the schools are governed by special boards. Mayor Robertson recommended that it would be in the interest of economy and efficiency to place all the schools under one board. During the year a new truck was purchased for the fire department and a compressed air plant installed in the city hall, to give power for fire alarms, at a cost of $100 a year. The Mayor recommends the purchase of deluge sets and such other improvements as the chief might suggest. Good work was done in improving the streets in 1903, but the plans made for future improvements should be carried out until every street was such that the city would be proud of it. Such sewer work as is ordered during the year should be done in accordance with plans made for a complete sewer system. The health of the city depends on the perfection of the sewer and water systems.

Mayor Weaver Believes in Competitive Bidding

The first annual message of Mayor John Weaver of Philadelphia, Pa., contained a number of important comments on the administration of the city. He is of the opinion that the affairs could be so administered that the tax rate would be kept down to $1.50. Regarding asphalt paving, he believes in the greatest possible competition, as it reduces the cost of the work. Contracts for street cleaning were let at too high a figure this year and he suggested that they be awarded the first of July for the following year, so that the city could prepare to do the work if the contract prices were too high, or so new contractors, if successful, would have opportunity to prepare themselves. Regarding gambling and vice, the Mayor claimed that policy has been entirely obliterated and that other vices have been largely suppressed. The Mayor threatened to revoke the license of any theater proprietors who did not obey the orders of the theater commission appointed by him after the Iroquois fire in Chicago.

Hornellsville Must Be Economical

The strictest economy must be practiced by the Council and city officials of Hornellsville, N. Y., according to Mayor William S. Charles, during the next year so that the city may get back into a good financial condition. The many improvements which, he says, the people would not part with at any price, have resulted in a heavy floating indebtedness bearing a large rate of interest and economy is needed to pay off this that the city may be in condition to go on with future improvements. Efforts should be made to pay off all but the bonded indebtedness. The floating indebtedness is about $49,000, bearing 6 per cent. interest.

All Streets Should Be Graded and Curbed

Mayor H. M. Hoyer, Altoona, Pa., is of the opinion that all ungraded streets should be graded, curbed, guttered, and permanent walks laid. Judging from the other cities of the State, he thinks they are satisfied with the work of this character done in them, despite the cost. He called attention to the defeat of the sewer extension proposition which would cost $150,000, stating that the main objection was that the administration could not be trusted, when, as a fact, the money could not have been raised and expended before another administration came into office. He suggested that all refilling of excavations in pavements, due to laying or repairing pipes, be done by the city engineer and the cost charged to the owner. This would do away with the unsightly holes in the streets due to poor work on the part of property owners. The Mayor has had considerable trouble in keeping the ranks of the police force filled because of the slender salary and the uncertain tenure of office. As long as the department is subject to change every three years, there will be more or less "slump in efficiency" towards the close of each administration.

Mayor Harrison Plans Solution of Franchise Problem

In an important message, Mayor Carter H. Harrison proposed two plans to the Chicago Council for a solution of the franchise and municipal ownership problem. The first plan is to pass an ordinance renewing the franchises based on a fair compensation to the city; from this to create a sinking fund such that after ten years the lines could be bought. The second plan is for the city to buy the property now and pay for it with certificates according to the Mueller law, lease the lines to the companies, and use the revenue thus derived for a sinking fund with which to retire the certificates. The other points touched upon by Mayor Harrison were the importance of securing authority from the Legislature to fix the price of gas; a State law providing for municipal ownership of gas plants and the right of the city to sell electricity commercially; the securing of the water power to be developed in the drainage canal; a new charter amendment; and the defeat of the plan to elect members to the Board of Education by popular vote.

More Revenue from Taxation

In his annual message to the Scranton, Pa., Councils, Mayor Alex. T. Connell dealt in length with the question of revenue and suggested means for securing more. He called attention to the fact that the real estate was furnishing 98 per cent. of revenue from direct taxation, a situation he considered altogether wrong. He urged that a license tax on businesses be imposed as is done in other cities. At present only peddlers and hucksters, dogs and certain amusements are licensed. To this list should be added, billiard and pool tables, bowling alleys, bill posters, hacks, omnibuses, baggage wagons, gunpowder dealers, rendering establishments, soap factories, oil peddlers, second hand dealers, junk dealers, etc.

The present occupation tax should be abolished and a per capita tax on all males over twenty-one years of age be substituted. He said, "This plan would increase our revenue anywhere from $15,000 to $25,000 per year. It has been the practice for many years in Scranton to rate occupations for purposes of taxation at various figures ranging from $30 for the laborer to $500 for the bank president. Under the old third-class city laws, all things taxable had a single value, as distinguished from the classification today, and the city millage applied equally to property or occupation. On our transition into a second-class city, however, real property was by law assessed at full value and then for purposes of taxation divided into three classes. In order to compensate for the increase in valuations, the millage was reduced, in round figures from 13½ mills to 4¾ mills. The reduction in the millage on real estate, however, at the same time became a reduction in the millage on occupations, but as the rating of occupations had of necessity remained stationary, the net result was to reduce the tax on occupations to only one-third its former figure. This situation has succeeded in effecting a reduction in the gross receipts from occupation taxes from approximately $15,000 to less than $5,000. More than this, however, it has resulted in thousands of cases in the city where persons who do not own any real estate are not paying any taxes at all for the support of the city government.

"The citizen who owns real estate pays not only the tax on his property but his occupation tax as well, for when he settles for his property tax, as he must, he pays his occupation tax also, as it is charged on the same bill; but the citizen who is answerable for occupation tax alone is so negligent about the tax that he pays no attention to it until the matter is brought to his notice by a delinquent tax collector, and even this we have reason to think is too often neglected by the collector. In thousands of cases the city occupation tax now amounts to only 14 cents, which it can be readily understood, is too small a sum to impress the citizen with the importance of either its payment or collection."

A tax of $1 a head, as is done by the school district, would bring in three to five times as much revenue as the present personal tax and could be well afforded in return for police and fire protection, parks, street lights, etc. "I believe it is high time that the citizens who do not own property, but who are enjoying equally with the property owners these things which the public revenues make possible and provide, should be asked to contribute a fair proportion towards the maintenance of the city."

A tonnage tax should also be imposed on all coal removed from land within the city. Mayor Connell recommended an ordinance to prohibit the burning of waste on any lot, and one to prohibit gambling.

In his message to the retiring councils, Mayor Connell reviewed the work of the year, stating that Scranton has smaller police and fire department and spends less on them than other cities of her size and that the same is true of the street cleaning, parks and other municipal departments. He recommended the economy practised by departments. The stamping out of small-pox will save the city a large amount. He endorsed the proposed raise in firemen's pay and urged that the work of building sewers and of grading and paving streets be pushed. The floods from the river must be prevented and he stated that the first work will be to prevent the dumping of waste material along the river bank and into the stream, and the second will be the construction of retaining walls to cost about $500,000. He hoped that the second work would not be necessary. The public service corporations refused to pay the poll tax of 50 cents a poll and a court decision on the corporation license tax ordinance must be made before the city will be able to collect the amounts due.

Great Waste of Water in Springfield, O.

The new water filter to supply the place of the supplemental water supply system was the principal work accomplished by the Water Department of Springfield, O., according to the report of Superintendent Ferguson. A number of extensions were made, twenty-five fire hydrants were installed, and 418 meters are now in use. The Superintendent recommended that all dead ends be eliminated as this would help the system very much. A number of streets should have better fire protection. Regarding the use of hydrants for sprinkling, the Superintendent strongly urged that no such permission be allowed because of the abuse to which the hydrant valves are subjected by the street sprinklers. Special hydrants have sprinkling valves attached, but even these are caused to leak through carelessness and no report

of the trouble is made to the Water Department. No one but the firemen should be allowed to touch the hydrants.

Superintendent Ferguson referred to the complaints so often made of the Department if, for any reason, consumers are deprived of water for a short time, as showing little appreciation of all the Department does. Lawn sprinkling came in for its share of attention, the Superintendent pointing out that much water is wasted in this way. Automatic sprinkling is another abused privilege. It should be regulated by a meter. He called attention to the fact that Dayton, with twenty-five times the number of taps, does not pump more water than Springfield. The amount of water wasted in the public buildings should not be permitted. The general adoption of the meter system throughout the city was strongly urged by the Superintendent.

Recommend Meters to Curtail Water Waste

Recommendations concerning the extension of the water mains in Bradford, Pa., appear in the annual report of the Water Commissioners. A special report of a consulting hydraulic engineer states that the reason for the low water pressure in the business section was largely due to the running of two hydraulic elevators, which should not be permitted to operate. Then, too, the water pressure for fire service is greatly reduced by the large draft on the supply by domestic consumption. Either a new main must be run from the reservoir to the business district, or the city must resort to fire engines to secure the necessary pressure.

The Commissioners reported that, notwithstanding the reduction of the water rates in 1901 of about 30 per cent., the revenues have steadily increased, having been $27,908.11 in 1903. Besides the sums expended since the reduction of rates, including final payments for the last reservoir, extensions of mains, etc., there were sufficient funds to pay off $15,000 water bonds, leaving a balance of $10,000 to be paid from the earnings of the Department for 1904. The water debt will then have been wiped out. These bonds were to have been paid for by taxation, but the earnings were sufficient to obviate this, and, in addition, the citizens enjoy the lowest water rates. Some of these rates are: First faucet, $3; each additional faucet, 40 cents; first bath, 80 cents; additional ones, 40 cents; first water-closet, $1.20; each additional, 40 cents. The system consists of thirty-four miles, 2,321 feet of pipe, 232 hydrants, and 21 Crown and 28 Pittsburg meters, which are placed in manufactories, hotels, etc. Superintendent S. D. Heffner stated that all manufactories and hotels should be metered, because of the large amount of waste. Experience showed that the city is wasting one-third or more of the water consumed. If all consumers were metered, there would be plenty of water for years to come and good fire pressure, while those who are economical in using water would not, as now, pay for the waste of others. The point has been reached when the consumption must be curtailed. The estimated number of gallons furnished each consumer is placed at ninety-six. The superintendent asked that the city pay the Department for the water furnished free to public and charitable institutions. The estimated value of this water is placed at $12,000 a year.

Lighting Rates in Wisconsin Cities

	Gas, rate per 1,000 feet.		Electricity, rate per 1,000 watts.	
	Light.	Fuel.	Light.	Power.
Ashland	$1.80	$1.50	$0.15	$0.10
Beloit	1.60	1.60	....	....
Chippewa Falls	2.00	1.50	.18	none
Fond du Lac	1.75	1.25	.16	.10
Green Bay	1.50	1.00	.17	.10
Janesville	1.60	1.60	....	....
Kenosha	1.50	1.00	.14	none
La Crosse	1.50	1.00	.10	.05 up
Madison	1.50	1.25	.16	.08
Manitowoc	1.25	1.00	.14	none
Mariette	1.50	1.00	.15	.10
Neenah	1.45	1.25	.12	none
Oconto	....	....	.20	none
Oshkosh	1.50	1.00	.12	.08
Racine	1.00	.80	.11.4	.07.6
Sheboygan	1.60	1.60	.15	.10
Superior	1.40	1.00	.10	none
Watertown	1.30	1.30	.15	none
Waukesha	1.30	1.30	.15	none

Akron to Have 30-Cent Gas

True to its promises to the citizens, the Council of Akron, O., passed the ordinance providing for a franchise to the Akron Gas Company based on the sale of gas at 30 cents per 1,000 feet. The Company had offered an ordinance allowing it to charge $1 per 1,000 feet, but this was tabled.

The new ordinance provides that the Board of Public Service shall have direction of all work done under this franchise. All street openings, etc., must be done so as to interfere as little as possible with public traffic. All service pipes must be put in to meet the approval of the property owners, the company must pay for service lines to curb, and must furnish and set a meter for each customer free of charge. Wherever street grades are changed, the Company must at its own expense, relay its pipes to conform to the same. All paving made necessary by the construction or repair of mains is to be done by the city and an itemized bill of the same rendered to the Company to be paid within ten days from the receipt of same.

The Company must not interfere with the water pipes or sewers of the city, or with the operation of the street railways. Upon written request of a sufficient number of property owners on a street so as to produce an average gross income of $100 for each 1,000 feet of pipe laid, the Company must lay up to 3,000 feet of pipe within six months.

The price to be charged for gas is not to exceed 30 cents per 1,000 feet, but a rate of 32 cents per 1,000 may be charged if the bills are not paid before the 12th of the month following consumption. A discount of 10 per cent. from the net rate on gas supplied to public schools, parochial schools, hospitals, public library, a day nursery and churches must be provided. Gas for heating and lighting fire stations and for the city hall must be supplied free. The gas must contain 750 British thermal units and be of nineteen candle-power. On accepting the franchise, the Company must pay for the

legal publication of the ordinance and file a bond for $10,000 to protect the city from any damages or charges by reason of the use of the streets by said Company.

Health Department Diffuses Information about Disease

D. F. RAGAN, Health Officer, San Francisco

THE need of spreading among the people a better understanding of disease and the knowledge of how to intelligently carry out the doctor's orders is felt by all health departments, but in only a few is anything done along these lines. The Chicago Health Department has issued from time to time a number of pamphlets, such as the "Vaccination Creed," published in a former number of the MUNICIPAL JOURNAL, "Care of Summer Complaints," "Care of Typhoid Fever in the Household," etc. These pamphlets have proved of great value. The Board of Health of San Francisco recently directed Health Officer D. F. Ragan to prepare a pamphlet on how to avoid disease and how to act when taken sick. It is called, "Health Hints for the Household," and is intended to supplement the doctor's work, to acquaint the people with the responsibilities resting upon them and to prevent the spread of disease by increasing popular knowledge of it.

Definitions of infection and contagion are given in this pamphlet, the germ theory is explained, and it tells how disease is carried by air, water and food, by animals and their parasites and their excreta. Great emphasis is laid on the last as being the original source of infection. It tells how experience has shown that one of the most effective carriers of disease is dirt which is laden with germs. Dust and filth are elements in which disease germs may live for long periods and are therefore dangerous. Cleanliness is the best antidote for filth, as it means the absence of dirt and, therefore, the absence of disease. In bold-faced type the pamphlet says, "To be clean is in a measure to be safe from infectious disease," and cleanliness applies not only to the person but also to the surroundings. Personal cleanliness is more important than public cleanliness.

The pamphlet advocates incineration for the disposal of all garbage and refuse. People are urged to open their windows and doors and to use water freely. The use of boiled water is advised and the addition to boiling water of a little common salt is suggested as adding to its cleansing power.

The duties of the Board of Health are outlined in this pamphlet, showing the people that the preservation of the public health and the spread of disease and contagion must be secured by this Board as demanded by law. The crowding of population necessitates the enforcement of the plumbing laws and the abating of nuisances which constitute a menace to health.

The second part of the pamphlet treats of quarantine. Stress is laid on the necessity of each family realizing its responsibility in case of disease that contagion may not be spread. The idea that it is humiliating to be quarantined is combated and it is pointed out how the compliance with a few simple rules of the Health Department will prevent contagion spreading and save many a poor family the annoyance, trouble, and expenses following the sickness that results from violation of the rules. To the diseases to be placed in quarantine, Health Officer Ragan added tuberculosis and a chapter on this disease is included in the pamphlet. While the consumptive is not to be separated from his family, a knowledge of the presence of the disease is required by the Health Board. The benefits to be derived from this course are the proper care of the invalid at his home that the disease may not spread, and the proper fumigation of the premises in which a death from tuberculosis occurs. Emphasis is laid on the fact that this disease is contagious and that many cases can be traced to houses infected by one invalid. Full directions are given for the isolation of the sick suffering from quarantined diseases and for the use of disinfectants.

Bay City Regulates Stringing of Wires

BEFORE any company, doing a lighting, telephone or similar business in Bay City, Mich., may string its wires or place its poles, it must first secure the permission of the Board of Electrical Control and file a detailed plan to scale of its proposed work, which must be approved. The Board is to consist of the Mayor, the City Engineer, Superintendent of Water-Works, Chief of Fire Department, and Superintendent of Electrical Lighting. The Board is to have the power to direct the installation of poles, wires, conduits, etc., as it may consider necessary for the safety and interest of the public. This work must be done in accordance with and under the direction of the Board by the company interested, and under the rules of the National Board of Fire Underwriters.

No lines shall be so placed as to injure or interfere with those of other companies, or injure or obstruct any street, shade trees, sewer, gas or water pipe. Unless otherwise directed, all poles must be placed along the walk, but no wires may be nearer than twenty-two feet to the surface of the street. Wires conveying currents of 500 volts or over must be kept separate from other wires by a distance of a foot or more, whether it parallels or crosses other wires. All wire must pass under and be one foot distant from fire department wires. All permits to erect poles must provide that the city may use said poles for the electrical services of the city, which must not be removed without permission of the Board. All wires entering buildings must be carefully insulated and on the outside of the building must be a switch to cut off current from within, and all electrical work must be done in accordance with the rules of the Fire Underwriters. The City Electrician is to inspect all work done and to remove work not properly installed when the same is not removed upon notice.

Fees for permits are to be collected by the City Electrician as follows: Fifteen lights or less, 50 cents; twenty-five lights, 75 cents; fifty lights, $1.25; and so on up to 500 lights, $5; over 500, each light 1 cent. For arcs, two lights or less, 50 cents; over two, 25 cents each. Similar fees are to be charged for wiring for dynamos and electrical machines based on the kilowatt capacity, running from 50 cents for one kilowatt up to $8 for sixty kilowatts. Violations of this ordinance are to be punished by fines of from $10 to $100 and imprisonment not exceeding ninety days, or both.

Theatre Regulations in Newark

THE theater ordinance lately passed in Newark, N. J., makes provision for the construction of future theaters so that they shall not be the scenes of disasters like that at the Iroquois fire, in Chicago, and provides for the alteration of present structures that they may be as safe as possible. All theaters must front on a street and may have a roof garden, provided the floor of the same is non-combustible and not over the stage. The auditorium, entrances, and passageways must be of fireproof material, no wood, canvas or the like being permitted, except a wainscoting of wood four feet high around the walls. The aggregate capacity of foyers, lobbies, passageways, etc., with exits to the street must be sufficient to contain the entire number of people in the ratio of 150 square feet of floor for each 100 persons. Gradients with one foot rise in twelve shall be used if possible instead of steps. Doors must be not less than five feet in width and open outwards. All finishing coats of paint or varnish must be fire-resisting. The outside walls of buildings are to be of brick or the like and be covered with asbestos paper and metal on both sides.

The Superintendent of Buildings must examine all theaters and report monthly their condition to the Council. Row seats must be twenty inches wide at the top of back and thirty inches from back to back horizontally. Seats now in use not that width must not occupy less space than that required by seats of the foregoing dimensions. There shall not be more than thirteen seats between aisles. The latter, having seats on both sides, must be three feet wide where they begin and must increase in width towards the exits in the ratio of one and one-half inches to five running feet. Aisles having seats on one side must be three feet wide. No draperies, curtains, or decorations may be in the auditorium unless of fireproof material. The roof and floor of the auditorium must be covered with asbestos paper and metal.

A fire wall sixteen inches thick must separate the auditorium and the stage the full width of the building and run four feet above the stage and auditorium roofs. This wall must run along the curtain line. No doors must open through this wall above the main floor and these must be fitted with fireproof doors. The proscenium opening must be fitted with a curtain of copper wire-woven asbestos, with fabric 100 per cent., and forty strands of wire to the square inch. The curtain must be guided by eyes running on wire cables which must be anchored in metal. The curtain must be lowered after each performance and be three feet from the foot-lights with no curtain in front or within six inches of it. All store and workrooms must be in the rear or at the side of the stage and be enclosed by brick walls and fireproof doors. A metal skylight fitted with hinged sashes and double thick glass not over one-twelfth of an inch thick, must be over the stage and be at least one-eighth the area of the latter. Each pane of glass must be at least 300 square inches in extent and be protected underneath with wire netting, but no wired glass may be used. The skylights must open instantly by cutting or burning a hempen rope. All the scenery, curtains and decorations must be of fireproof material.

There must be four emergency exits for each tier of galleries or main floor, each exit to be five feet wide, with doors of wood covered with non-combustible material on the outside. Doors must be fastened only on the inside with a movable bar. Stairways from balconies must not be less than four feet wide and when the balcony seats over 500, the stairway must be increased six inches for each 100 persons. All balconies must be of iron throughout. Separate places of exit and entrance must be provided for each floor and balcony. Plans of exits must be printed on programs and each exit must be marked as such by eight-inch letters, be free from draperies and be lighted by an oil lamp with red globe.

Separate lighting arrangements must be made for the stairs and passageways, to be controlled from the lobby. There must be a three-inch standpipe with hose attachments on every floor and gallery, to be supplied with an independent water supply of 500 gallons per minute with pressure of sixty pounds. Fifty feet of hose and nozzles must be attached and a system of automatic sprinklers, with fusible plugs and supplied from a tank of 1,200 gallons capacity, must be placed on either side of the proscenium opening, over the stage, and in the dressing, store and property rooms.

Pasadena's Municipal Sewage Farm

How one city solves a problem is always of interest to other cities that are similarly situated, and so municipalities of the size and character of Pasadena, Cal., will be interested in learning of the way the sewage of that city is disposed of without offense to anyone. In 1892, Pasadena adopted the irrigation method for sewage disposal. The discharge of its sewage into the ocean thirty-five miles away was too expensive an undertaking, and there was no river into which the sewage could be emptied. At the suggestion of a citizen, after considerable discussion, the city purchased a farm of 300 acres about five miles from the city and established a complete sewer system connecting with a twenty-two-inch outfall sewer which carried the sewage to the farm. All the sewer pipes are of vitrified clay and the fall is about fifty feet to the mile. The city has a population of 10,000 and the sewage averages about 430,000 gallons per day. The sewers are sanitary ones, so that the storm water does not get into them. The laterals amount to forty-six and one-half miles and the outfalls, six miles. There are 650 manholes and 140 flush tanks. To put in this system cost the city $313,457, while $37,500 were spent for the farm.

At first the farm was leased and the tenant planted it with alfalfa, but because this could not be cultivated frequently, the farm became an offense to the neighbors, inasmuch as the sewage formed a crust on the surface and fresh sewage could not sink into the ground. Then, after a year, a manager was employed by the city and the character of crops carefully determined, so that frequent cultivation would keep the surface broken up and give the sewage a chance to filter down. All complaints on account of odors then ceased. The entire farm is surrounded by eucalyptus trees, planted ten feet apart and five rows deep. There are ninety acres of English walnuts, twenty of pumpkins, 130 of hay

and grain, forty of corn, and six of alfalfa, the farm buildings and manager's house occupying the remainder of the land. The present manager, Mr. S. O. McGrew, raises two crops a year.

Before the seeds are planted, the ground is well flooded. Then plows and cultivators thoroughly loosen the ground and the planting takes place. No irrigation is done after the seeds are put in and vegetables and small frutis are not planted for fear of contamination. The growing corn is irrigated by running sewage along the furrows, but the corn fodder is always burned. The walnut industry is the most profitable, the sum of $4,738.75 having been realized in 1902 from a sixty acre grove. After harvesting, the grove is flooded and cultivated alternately for three months while the trees rest. No irrigating can be done during leaving and fruiting periods because of the growth of fungus on the fruit. No tiled trenches are used, but eight-inch furrows are made with plows.

A drove of 115 pigs are raised on the farm and the management hopes to increase it to several hundred. The hay and grain raised is used for the horses of the city departments and a large amount is sold. The old city horses are used for farm work after giving out in city service. The expenses incident to running the farm amounted to $5,124 in 1902 and the receipts from produce were $9,446. As the ground grows richer each year, larger and better crops will be gathered and the city's income from the farm will gradually increase.

New Building Rules in Norfolk

An ordinance amending certain sections of the code of the city of Norfolk, Va., respecting building regulations, has been passed by the Councils of that city, the following provisions being the most important:

The inspector of buildings must inspect all new buildings under course of erection and all in which repairs are being made. A forfeit of $20 is attached to all failures on the part of the inspector to visit such buildings within forty-eight hours after notice. He must sign all certificates and permits for building and assist the City Attorney to prosecute all violations. The provisions of this ordinance do not apply to U. S. Government buildings. No permit for building is to be granted unless a water tap has been applied and paid for, or where there are sewers, unless sewer connection has been applied and paid for.

Fees for permits for buildings and inspection for houses with ground floor 1,000 square feet in area, $2; 1,000 to 1,500 feet, $3; $1 additional being added for every 500 square feet. For houses over two stories high, additional fees of $1 for every 1,000 square feet of area up to five stories; for every story above five, $1 for every 1,500 feet. These fees do not apply to churches or the like.

The thickness of brick walls for dwellings must be not less than twelve inches from cellar of one-story buildings; sixteen for three-story; twenty for five-story; and twenty-four for eight-story; for upper stories, a scale of thickness diminishing, as a rule, four inches with each story in height, is provided. Walls faced with stone must have a backing of hard brick. No wrought iron columns must be of less than one-quarter inch thickness of metal, nor of an unsupported length of more than thirty times its dimension or diameter. In stud partitions, hot-air pipes must be covered with asbestos and be at least one-inch from studding.

Floors must bear a weight seventy-five pounds per square foot for dwellings; 100 pounds for buildings for light mechanical purposes; 150 for buildings for public assemblage; 250 for stores, warehouses, and buildings for heavy mechanical purposes. Except in dwellings, scantling partitions must not support roofs or floors.

Signs must not extent over two feet from buildings, must be twelve feet above sidewalk, and a permit must be secured for them under penalty of $20 fine. Builders may use the walks and one-half the street (when over twenty feet wide) for building materials. Fire escapes must be attached to buildings where twelve or more persons are employed higher than the second story, and on all hotels, halls, schools, lodging houses accommodating over twelve lodgers above the second floor, and all office buildings with six rooms above the second floor. All plans for buildings must be filed with applications for permits.

City Rights Protected in Railway Franchise

One of the strongest franchises for a street railway, as regards the protection of the city's interests, was recently granted by Tacoma, Wash., to the Commercial Trust Company of that city. It provides that the road must be started within six months after acceptance of franchise, that $10,000 be spent on it within the first year, and that it be completed within two years. If any portion of the road be not operated for thirty days, except the failure to operate be due to riots, strikes, acts of elements, or the like, the franchise shall be void. In such case, within thirty days after notice, the company must remove all poles, wires and tracks and place the streets in the same condition as previous to occupation, under penalty of having the work done by the Commissioner of Public Works at the expense of the company and of having the materials confiscated by the city.

Tracks must be flush with the grade of streets so that no inconvenience is caused vehicles in crossing them. Between the tracks and for one foot on either side, the company must pave with the same material as that used on the rest of the street and must keep the same in good condition during the life of franchise to the satisfaction of the Commissioner of Public Works. When the street is repaved, the space between the tracks must also be repaved by the company. Tracks must be of standard gauge and, where there are double tracks, the distance between centers must not be more than twelve feet.

In crossing any gully or ravine, the company must construct and always maintain in good condition, bridges or viaducts, made of the very best material and according to plans approved by the Commissioner of Public Works. These bridges must be always free for traffic of teams and pedestrians, except that the bridges need not be wider than necessary for car traffic exclusive of sidewalks. If the lines

cross a bridge of the city, one-half of the cost of construction and maintenance must be paid by the company, under penalty, after three days from presentation of bill, of suspension of franchise rights until amount be paid. Bridges to belong to the city after expiration of franchise.

The fare for a continuous trip shall not exceed 5 cents, with free transfers to any other line within the city giving transfers to this company's lines. Semi-annually, for the first five years, the company must pay the city 1 per cent. of the gross receipts during the six months; after that period, 2 per cent. must be paid. Books must be open to the city and a sworn statement of gross receipts must be presented by the company. If reports and percentages are not presented, the franchise will be suspended until the same are received.

The city shall at any time have the right to purchase the company's property at a reasonable price and shall have the right to regulate the operation of cars and provide for the protection of citizens against injury by them. Before the company may lay its lines on any street, the damages to the property owners must be determined and compensation made therefor. Plans for all work of the company must be filed with the Commissioner of Public Works and be approved by him. A metallic return line must be provided for return of current. In case it be desired to remove any building across any street car line, the wires must be cut by the company and put back again after moving is done, or the city will do the work at the expense of the company. The city may regulate at any time the speed of the cars. The steps of the cars must be well lighted, illuminated signs must be provided, and the number of cars run may be determined by the city. None but package freight is to be carried on the cars and no package shall exceed 150 pounds in weight, and none may be carried until a private freight yard is provided. The city may regulate the hours when freight may be carried.

The city shall always have the right to pave, sewer or improve the streets, without paying for any damage to the company, and may suspend running of cars for that purpose, removing tracks or poles if necessary, at the expense of the company which must replace them within thirty days under penalty of having the work done by the city at company's expense. The cost must be paid within thirty days or the franchise is to be suspended until it is paid. The company must defend and protect the city from all damages on account of the road and pay what judgments are obtained against the city within thirty days or the franchise is to be suspended until judgments are paid. The franchise is to run twenty-five years, after which the tracks must be removed by the company. All postmen, policemen and firemen in uniform must be carried free. The franchise must be unconditionally accepted by the company and a deposit of $1,000 must be made, to be forfeited if the construction of road is not done in the time specified.

To Keep City Boys Out of Mischief

The purpose of the Civic Improvement League of St. Louis is to endeavor to make the city a better place in which to live and to create a better administration of municipal affairs without entering into politics. The League works for the enforcement of ordinances that tend to make the city healthier, cleaner and more attractive. The League has organized a Junior School of Horticulture, that the enthusiasm of the children may be directed into channels that will not only give them great pleasure and prevent their getting into mischief, but also encourage sentiment for a more beautiful city.

This school was organized in June, 1903, with six boys and rapidly increased to seventy pupils by the end of the summer. The value of the garden products taken home by the children was a demonstration of the profitable way in which the boys spent their summer. A tract of land was secured and divided into gardens seven by twelve feet, each garden being assigned to a pupil who must completely prepare and plant it before obtaining another garden. Lessons begin in April and are continued until the fall, each class meeting once a week at 4 p. m., and credits are given for punctuality, attendance, good work, and good behavior. All the vegetables and flowers raised are given the pupils. The League furnishes the land, instructor, seeds, tools and fertilizers. If the pupil is absent from a regular lesson, or does not do his work assigned for the day, his work will be done for him and he must pay for the same before receiving another lesson. Gardens are to be forfeited by two absences without notification. Prizes are awarded for good work. no smoking or playing is allowed in the gardens and pupils must respect the rights of others. All tools must be well cleaned and returned to the tool house at the end of lesson, and only tools provided by the League are to be used.

Civic Improvement League of St. Louis

Office, 605 Mechanics National Bank Building *Telephone, Main 4835 A*

Application for Membership in the Junior School of Horticulture.

St. Louis, Mo. ..... 19 ....

Name ..... Age ..... years.

Nationality or Descent .....

Parent's Name .....

Occupation of Parent .....

Residence .....

From what School ..... Grade .....

Principal's Name .....

Remarks: .....

Fill out and mail to the CIVIC IMPROVEMENT LEAGUE, 605 Mechanics National Bank Building.

Any boy in the city is entitled to enter the classes and a class of girls is to be formed this year if the demand warrants it. One of the objects in this school is to develop a desire for beautifying home gardens and yards and instruction is to be given in regard to this work, the instructor showing how some of it can be done and giving directions for the rest. The accompanying illustration shows the application blank for membership in the school.

Finances in Newport

Some changes should be made in the manner of purchasing supplies for Newport, Ky., and in the reconstruction of macadam streets in the opinion of City Auditor Alfred Silva. The cost of the latter is excessive. The total disbursements for the past year amounted to $282,377.67, and the receipts were $268,574.32, but the balance on hand, January 1, 1903, including general and special interest and sinking funds, left a balance on hand, at the beginning of 1904, of $53,365.48.

NEWS AND PRACTICE AMONG THE CITIES

Houston Gets Franchise Referendum—Municipal Insurance in Pittsburg—Large Water Waste in Cities—Relative Paving Values—City Finances

Municipal Light Plant for Burlington

THE erection of a municipal electric light plant for Burlington, Vt., was urged by Mayor Burke. The Council was restrained from issuing bonds for this plant because of doubt as to their legality, but the Mayor suggested that all doubt of legality should be set at rest by the Council. A curfew law was also recommended by the Mayor, providing that, after nine o'clock no child under sixteen should be on the streets, unless the child be properly accompanied, be on an errand with written directions to perform the same, or be engaged in his duties. The Fire Department must be maintained at the highest efficiency and a competent head be selected for it. He concluded his message with the admonition to the Council to attend closely to committee work and look well to details, for anything worth doing was worth doing well.

Great Water Waste in Portland

THE great waste of water in Portland, Ore., would supply another city of the same size or larger if used economically, as is shown by statistics in the report of the Water Board of the city. About 200 gallons per capita are consumed daily by the citizens. The rates for water have been gradually reduced and are now less than one-half those charged by the private company that formerly supplied the city. After seventeen years' service the net profits from the works applied to the extension of street mains and other construction was $1,401,813.55. Of the receipts for this term, operating expenses and repairs consumed 21.5 per cent.; interest on bonds, 42.9 per cent.; net profits for extensions, 35.6 per cent. There are 207 miles of street mains and the receipts from water in 1903 were $393,446, with operating expenses of $51,158. The Water Board is gradually checking the waste of water by attaching meters to places where waste is detected as fast as the funds are available. After January 1, 1905, a sinking fund for the redemption of the water bonds will be started, the fund to consist of a portion of the receipts from sale of water.

Expense of Tacoma's Government Increasing

DURING 1903, the net indebtedness of Tacoma, Wash., increased $38,076.08 over that of 1902. At the end of 1903, the indebtedness was $1,549,139.79, as shown by the report of Comptroller Alfred Lister. The increase in running expenses of the government amounted to $40,421.50. The disbursements aggregated $1,102,116.27; in 1902 they were $927,306.59. The receipts of the city amounted to $909,538.89. The running expenses were larger than at any time and showed a big advance over the past two years. The cash balance at the end of 1902 was $150,364.42, and the net debt was $1,511,063.25; at the end of 1903 it was $70,375.26. The total cash receipts from the water and light plant were $257,028.24 and the amount taken from the water and light fund for general city expenses was $112,300.

Houston to Have Referendum on Franchise Grants

AT the recent biennial election in Houston, Tex., the citizens had an opportunity to express their will regarding the referendum on all franchise grants. An ordinance providing for the submission of this question was passed last year and approved by Mayor Holt. Any ordinance granting a franchise shall not be passed by the Council if the citizens vote against the same. The referendum question was carried in Houston by a vote of three to one. It is required that at least 500 voters of the city must petition the Council before any franchise ordinance be submitted to popular approval or rejection, but the Council, in the absence of such a petition, may decide as to whether the proposed franchise shall be submitted to the people. This opens the way towards better control by the people of Houston of their city and, while the number of petitioners required is large, a step in the right direction has been taken. Later a reduction in this number can be effected.

Municipal Insurance for Pittsburg

IT has been proposed to introduce municipal insurance into Pittsburg, Pa., the city insuring its own buildings and thus saving the large premiums exacted by the insurance companies. A fund is to be created under the supervision of the Sinking Fund Commission and all money received from such policies on buildings that have a surrender value, after sale of the same, shall be turned into this fund, together with an amount equal to the premiums now paid annually on those policies. This fund is to be allowed to accumulate until $250,000 is realized and when an excess of $50,000 has accumulated, that sum is to be used to extinguish the city debt. The sum of $90,000 will be available at once from return premiums saved which will guard the city for the coming year, as only a little over $50,000 has been paid the city in losses for the past ten years.

Good Work of Montclair's Health Board

The work of the Health Department of Montclair, N. J., should make that place a very healthy one to judge from the report of what has been done during the past year. The Board keeps track of the quality of ice supplied to citizens, testing samples from time to time to prevent sale of impure product. It carefully guards the milk supply by testing samples supplied by each dealer at odd times as to the nutriciousness of the liquid, its purity and the amount of bacteria per cubic centimeter. In its report, the Board prints the results of the tests of each dealer's supply, giving the man's name, and passes judgment on the general character as shown by the tests and its knowledge of the source of supply. It does not hesitate to condemn supplies that are not good or warn citizens against them. It is this publicity that will do more than anything else to maintain the purity of the milk supply. Prompt isolation of persons taken with communicative diseases and thorough disinfection prevented the

spread of these diseases. Long and persistent efforts finally traced the source of a typhoid outbreak to one milk dealer's supply, where carelessness on the part of the dealer in sterilizing bottles and apparatus, resulted in a large number of cases of this disease and the ruin of the dealer's business. The Board oiled a number of the ponds about the town every week in the endeavor to kill off the mosquitoes, and has been endeavoring to arouse citizens to the necessity of a concerted effort on the part of all to rid the town of these pests.

Considers Creo-resinate Wood a Standard Pavement

A record of the work done by the Board of Estimate and Apportionment of New York City in 1902-3, is outlined in the report of its engineer, Mr. Nelson P. Lewis. Speaking of the pavements laid, he touched upon the stretches of creo-resinate wood block laid in Brooklyn and Manhattan boroughs and on the roadways of the Williamsburg Bridge and stated that, while the cost of this paving was greater than asphalt, it is a most agreeable pavement, more quiet by far than any other in use and it must be considered as one of the standard pavements. The practice formerly followed in Brooklyn was to include paving, curbing and regulating of streets in one contract with the frequent result that pavements were laid before sub-surface structures were provided. The practice during the past two years has been to separate the contracts into regulating and grading, followed by paving after sewers and water and gas mains were laid. This enabled the property owner to pay for improvements in two instalments, and prevented the tearing up of streets to lay pipes, etc.

Regarding the provision for parks, Mr. Lewis called attention to the costly practice of not providing for park areas in a general scheme as is the case in planning street systems. Parks should be planned in advance of the growth of population in any section and so as to accord with a general park system for the city. At present 10 per cent. of Manhattan borough has been reserved for parks, 15 per cent. in the Bronx, and but 2½ per cent. in Brooklyn borough.

Low Water Rates in Battle Creek

About 58½ per cent. of all water used in Battle Creek, Mich., is paid for by meter at the rate of 10.2 cents per 1,000 gallons. But 6 per cent. is paid for on flat rate, while the 35½ per cent. is water furnished free to city institutions, for flushing sewers, for drinking fountains, fires, leakage and slippage of pumps. Thus, $10,680 worth of water is supplied to other city departments at the expense of the Water Department. The financial results of operating the water-works for 1903 showed a net gain by operating of $12,294.46. This included depreciation estimated at 5 per cent., interest on bonds at 4½ per cent., and operating expenses at $12,548.59. The cost of supplying water to the city is properly included in the receipts, the rate for hydrants being placed at $40 each per year, although this estimate is often lost sight of by opponents of municipal plants. The depreciation is placed at 5 per cent., but it is doubtful if this percentage is not too large. There are 232,361 feet of mains, over one-half being six-inch pipe. Meter rates run from 7 to 13 cents per 1,000 gallons with a minimum at $3; 87 per cent. of the taps are metered, and the meters are either sold at cost or rented at an annual charge of 15 per cent. on the cost. Meters are placed on all new takers and on all changes of pipe.

Relative Value of Pavements in Charleston

In considering the appropriation of $22,900 for drains, walks and paving in Charleston, S. C., the Board of Public Works submitted to the Council some statements regarding the cost of laying different kinds of paving with its opinion as to the worth of each kind. Thus, it estimated the cost of asphalt per square yard at $2.30; vitrified brick on concrete at $2.25; Belgian block at $1.90; brick on sand, $1.50; clay macadam and plain macadam at 80 cents each; and cement gravel at 70 cents. It stated that the last named lasted but a short time and was expensive to repair. The macadams lasted seven or eight years and, after the fifth year, needed constant repairs. Belgian block was considered the most durable and most desirable for heavy traffic. Asphalt was a luxury that could not be afforded and was, in many respects, no better than brick. Vitrified brick could be laid on sand when the subsoil was virgin and on concrete when it was not. It seemed to have proven satisfactory in every place it had been used, needs little or no repair, and has a long life. The Board considered it the most desirable roadway both from the standpoint of durability and the cost of maintenance of any but the heaviest traffic. As the work the Board desired to do would cost $45,000, it was proposed to pay the contractors one-third or one-fourth of the amount in cash and 7 per cent. interest on deferred payments extending throughout the term of the present administration.

Finances of Providence

The report of the City Auditor of Providence, R. I., Mr. Philip S. Chase, shows the financial condition of the city treasury and the receipts and expenditures of the city government. He gives the balance in the treasury at the end of the year as $307,533.68. In the account of expenditure is included over $495,500 for sinking funds. If this amount stands for simple transfers to the sinking fund, it has no place in the treasury account which should show only the actual cash receipts and payments of the city. The receipts from all sources are arranged in two columns according as they are "ordinary" and "extraordinary," and the expenditures are stated in the same way. The "ordinary" expenditures amounted to $4,449,775.99, and the "extraordinary," $1,267,671.85, or a total of $5,717,447.84. The total "ordinary" receipts were $4,464,438.79, the "extraordinary," $1,285,777.36, and the total, $5,750,216.15. The city debt amounted to $18,337,420.06 at the date of the report, and the sinking fund account was $4,527,482.49. All these gross amounts are extended under heads which show what the city is paying for the operation and maintenance of its different branches and the receipts from its several sources. It may be learned from the detailed expense account what is paid each officer for salary as well as the running expenses of his office. An inventory of the real estate owned by the city is given, as well as one for personal property. The report of City Treasurer Walter L. Clarke is appended to the Auditor's report.

STORAGE OF PETROLEUM AND CHEMICALS

Practice in England Applicable Elsewhere—Causes of Explosions—Precautions to Be Taken with Explosives and Petroleum

By Captain Thomson *

At first sight it would appear to be better in the interest of public safety to prohibit altogether the keeping of explosives in populous places; but in every civilized community it is necessary to balance the requirements of personal safety against those of important trades. For this reason limited amounts of explosive are allowed to be kept even in the midst of cities in this country, and in most other countries of the world.

For purpose of sale there are two methods in which explosives may be legally kept in populous areas. These are technically known as modes A and B; the former consisting in the use of a building or fire-proof safe detached from place of sale and from any public thoroughfare, the latter in a substantial receptacle within the shop.

I will now deal with the precautions enjoined by law, and with others which appear to me desirable. In the first place the receptacle in which the explosive is kept must be exclusively appropriated to such keeping, and must be kept locked so as to prevent mischievous or inexperienced persons from access to the explosive. The interior of the receptacle must be free from grit or exposed iron, and must be kept clean and free from spilt explosive. As to the best form of receptacle, there may be some difference of opinion. The ordinary japanned tin trunk is frequently used for keeping explosive under mode B, and in my opinion this is a very good form of receptacle, especially for fireworks. Sometimes a strong wooden box is used, while some traders prefer to fit up a cupboard or drawer for the purpose. This latter method has the disadvantage that it is not so easy to remove the explosive in case of a fire. Gunpowder or smokeless powder may be kept in a fireproof safe, but the law no longer gives any advantage in respect of quantity to the trader who uses this form of receptacle, with the exception of those who register their premises for the keeping of gunpowder only, and who may still keep 100 pounds in a fireproof safe under mode B. This privilege has been taken away by an alteration of the law in regard to premises registered for explosives other than gunpowder, the reason being that the advantage of a fireproof safe for the keeping of explosives is regarded as more doubtful than it was when the Explosive Act was passed. At that time experiments were made by subjecting safes containing small quantities of gunpowder to the heat of an actual conflagration. The results were satisfactory in the highest degree, and there is no doubt that a well-constructed fireproof safe, under normal conditions, does offer good protection to its contents against destruction by fire. Nevertheless, on two occasions, well-made fireproof safes have failed to prevent an explosion. When an explosion does occur in a safe its effects are liable to be more disastrous than if the explosive is contained in a less substantial receptacle. Another disadvantage of the use of a safe for explosive is that, owing to its great weight, it cannot readily be removed in case of fire. This brings me to the consideration of the best position within a building for the keeping of explosives. The only regulation on the subject is to the effect that the explosive may not be kept in dangerous proximity to articles liable to cause fire, or of a highly inflammable nature. Among traders there is considerable difference of opinion as to the safest position in which to keep their explosive. Some prefer to place it at the extreme top of the house, and there is a good deal to be said for this practice. At the top of a building an explosion would generally be less disastrous to life and property than one on the ground floor. Again, when placed in a top room, the explosive will be less accessible to unauthorized persons, and will be freer from certain dangers of ignition to which it might be exposed in a part of the building which is much

VIEW OF ROCHESTER (N. Y.) FIRE
Showing Place of Origin in Building in Center

* H. M. Chief Inspector of Explosives, who read this paper (slightly condensed) before the International Fire Prevention Congress at London, Eng., 1903.

frequented. On the other hand, explosive at the top of a building is more difficult to remove and more likely to be involved in the case of a fire in the building. Again, the keeping of the explosive in an attic often involves the use of a naked light, if the receptacle has to be opened after dark, and this may involve a danger which would be absent if the receptacle is kept in a well lighted shop. On the whole, I consider that the balance of safety is in favor of a light receptacle placed on the ground floor within easy reach of a door, through which it can be removed from the building. It will be seen from what I have said that I regard it of high importance to be able to remove explosive altogether from a building in case of fire, and for this reason I consider it desirable that the chief officer of the fire department in every town should keep himself informed, not only as to the premises which are registered for explosive, but also as to the position of the receptacle in each case.

Causes of Explosions

Coming now to the causes which lead to the ignition of explosive, I need hardly say that the most frequent cause, and the one against which the most careful precautions must be taken, is the direct application of a spark or flame. A gas-flame near the receptacle is not necessarily a source of danger; but if proper care is not taken to keep the receptacle shut and to avoid the spilling of explosives, an ignition may be caused by the careless throwing down of a smouldering match at the time when the gas is being lighted. An ignition from a spark caused by the impact of iron surfaces or of iron and stone, is of more rare occurrence, but this also must be guarded against. It is advisable to cover the floor immediately round the receptacle with linoleum or other soft material, which will not only facilitate the sweeping up of any spilt explosive, but will also prevent the possible striking of a spark between a nail in the floor and one in the boot of a person approaching the receptacle.

The law of this country prohibits the keeping in one receptacle of explosives which may be dangerous to one another. Thus, ammunition which carries its own means of ignition, such as sporting cartridges, is not allowed to be kept with gunpowder; and fireworks, owing to their miscellaneous character, are always to be kept in a receptacle by themselves. There is no danger, however, in keeping any of the varieties of smokeless powders and blasting explosives authorized in this country in the same receptacle, and this is allowed by law.

Petroleum

We now come to the consideration of the storage of petroleum, and here we have to deal with a somewhat different class of danger, which must be met by different precautions. From the point of view of fire prevention I regard petroleum as more dangerous in some respects than explosives. In the first place it is in more general use and more extensively stored in populous places. If an explosion of gunpowder occurs much local damage may be caused, but usually the whole of the powder will have been consumed, and the resulting fire may not be difficult to deal with. It is otherwise with petroleum. If an explosion of petroleum vapor takes place the damage done may be quite as great as that due to the gunpowder explosion, while the after consequences may be much more serious. The vapor explosion will almost certainly be followed by a fierce conflagration of the petroleum itself, and if any considerable quantity is present the conflagration may be such as to defy the efforts of the most skilful fire department. Water is of little use in extinguishing a petroleum fire, as the liquid will float and continue to burn on its surface. I have no wish to exaggerate the dangers in storing petroleum, but only to indicate the very serious consequences which may ensue from the neglect of ordinary precautions, which unfortunately sometimes prevails amongst those who trade in this commodity.

Before dealing with these precautions it may be well to say a few words about the properties of petroleum, in order to dispel certain misconceptions which appear to be rather widely entertained. Strange as it may seem, it is by no means uncommon to meet with well-educated persons who believe that petroleum is in itself an explosive, while others believe it to be capable of spontaneous ignition. These persons generally hold the belief that when the liquid is raised in temperature to a degree known as its "flash-point," it explodes, bursts into flame, or else undergoes some marked physical change. These beliefs are, of course, absolutely unfounded. It is upon the volatility that the danger in the storage and use of petroleum greatly depends.

I have said that the liquid is inexplosive in itself, but the vapor when mixed with air in certain proportions is capable of exploding with great violence when ignited. Fortunately the proportions necessary to form an explosive mixture are very limited. The mixture begins to be inflammable when there is about 1.8 per cent. of vapor. An increase to 2 per cent. renders the mixture explosive, while when the proportion exceeds 4 per cent. the liability to explosion begins to disappear, but the mixture continues to be highly inflammable.

Petroleum should be kept in metal vessels wherever possible. I regard this as imperative in the case of gasoline, having recently had experience of the danger of leakage of vapor through wooden barrels. Such barrels are still strongly advocated by some persons, both for the conveyance and storage of petroleum, but in the case of gasoline I find their arguments entirely unconvincing. One of the principal virtues of a wooden barrel when used for an aqueous liquid is that the liquid swells the wood, and increasing the pressure between the staves diminishes the chance of leakage. This quality is entirely lost with petroleum which, though it permeates the wood, has no effect in swelling the staves. Consequently to keep the petroleum from all leaking out, it is necessary to coat the interior of the barrel with glue. When this coating is fresh, the barrel may be fairly free from leakage; but when owing to dry weather the staves have shrunk, or when the barrel has been knocked about, the glue coating becomes defective and more or less leakage inevitably occurs.

(To be Concluded in June.)

Calcutta Gets a Large Engine

A POWERFUL steam fire engine has lately been placed in service by the Calcutta (India) Port Commissioners. It is one of only two engines of its size and the two are the largest horse-drawn fire engines in the world. The other engine of this type was placed in service in Liverpool in 1893 and was illustrated in a former issue. The engine shown in the accompanying illustration is slightly larger than the Liverpool machine. It has double cylinders and is capable of discharging 1,800 gallons of water per minute, and weighs only 8,300 pounds, thus pumping over one gallon of water, ten pounds, for every five and one-half pounds of its own weight. The quantity of water thrown is equivalent to the amount thrown by four of the ordinary size of steam fire engines generally in use in town fire brigades. The full quantity of water, 1,800 gallons per minute, can be thrown to a height of 220 feet through a single jet fitted with a two and one-quarter inch diameter nozzle. The boiler is of the quick steam raising type, and steam can be raised to full pressure in from eight to ten minutes from time of lighting the fire. The engine has six delivery outlets, each three and one-quarter inches diameter, thus enabling six separate streams of water to be thrown at the same time.

The hose regularly supplied with the engine was of canvas and three and one-quarter inches in diameter, but the standard size of hose used in the Calcutta Fire Department and on the fire-boats

ONE OF THE LARGEST STEAM FIRE ENGINES—CALCUTTA, INDIA

of the Port Commissioners is two and three-fourths inches in diameter. Hence, it was necessary to supply the connection screws to permit of using the smaller hose. At the same time, the larger hose can be used when required.

The stoking is done in the rear of the engine and coal bunkers are fitted on each side of the fire door. Vulcanized india-rubber suction hose with a diameter of nine inches is used.

At the official trial, Chief Engineer Clare, of the Calcutta Fire Brigade, had charge. The boiler pressure was worked up to 125 pounds and water pressure to 120 pounds. Steam was raised to 100 pounds pressure from cold water in ten minutes from time of lighting the fire and 120 pounds pressure obtained in eleven minutes. Under ordinary conditions the engine is never likely to be required to work over 100 pounds boiler pressure and about eighty pounds water pressure. The pump commenced work with one jet only, nozzle two and one-quarter inches diameter (in this instance the water pressure was up to 130 pounds), and the stream of water was thrown well over 200 feet high as nearly as could be judged. In the second test two jets were used and the nozzles were one and one-half inch each. In the third test three streams were tried, with two nozzles one and one-quarter inches and one one-inch in diameter. Four streams were used in the fourth test, three nozzles being one inch and one seven-eighths inch in diameter. The full six streams were tried in the fifth trial, each nozzle being seven-eighths of an inch. The engine ran more freely and steadily with the four one-inch and the six seven-eighths-inch streams than with the other combinations, and the Port Commissioners were thoroughly satisfied with the results. The character of the teams to be used in drawing the engine, it is objected, will handicap it in quick hitching and, under tropical conditions, it is next to impossible to keep horses in due state of readiness. It is suggested that machines of this size and weight should be of the automobile type.

New Method for Identifying Criminals

M. BERTILLON, the head of the Anthropometrical Department at the Paris Prefecture of Police, has been adding a new and important invention to those which have rendered his name so well known and have been of so much service in the identification of criminals. It is the system of what is termed "portraits parlés," and so great has been its success since its introduction a few months ago, that M. Lépine has made proficiency in it one of the conditions of promotion in the force. At the outset, the police did not take very kindly to the new study, but after some initiation into its mysteries they found it fascinating and now they are quite enthusiastic about it. What is the "portrait parlé"? Before M. Bertillon made his discovery, photography was used in the ordinary way for the detection of criminals. There was a resemblance between the individual who was being looked for and a certain portrait, and this was regarded as sufficient demonstration of his identity, the result being a percentage of sixty or seventy blunders. Now these mistakes are reduced to one per cent., thanks to the new system, it being, indeed, argued that error is practically impossible.

On the walls of the rooms in which the lessons are given is affixed the following motto, which explains it all: "The eye only sees in everything what it looks at, and it only perceives what is already forming in the mind." A resemblance only was sought for, and when it was thought to have been found, various details were conveniently passed over. Now, however, the various features are scrutinized separately, without any temptation to jump to a too prompt conclusion. M. Bertillon is, in fact, teaching the police to be very critical in the examination of the form. The mouth, the nose, the forehead, and the ear are studied in quite a scientific manner. There are, as goes without saying, many types of each feature, and the men are taught to look out for and distinguish between them. Particular attention, for instance, is paid to the ear, as it is held to be the feature which possesses the greatest variety of shapes. The "portrait parlé" deals with no fewer than sixteen specimens, as in the description of the criminal the ear occupies the first position in the matter of importance. Then, with regard to the forehead, when the policeman describes it as high, medium, or narrow, he now knows to a mathematical nicety what he means. So it is with the other features as well, and, instead of seeking for a general resemblance, and being satisfied if it is found, the spectator minutely inspects details, and is not convinced until he has conscientiously discovered that every point tallies with the description which is appended, as already explained.

M. Bertillon has given the Detective Department an album containing upwards of 1,500 photographs of individuals who are not allowed to live here, of 400 of others who have escaped from the penal settlements, in French Guiana and New Caledonia, and of 100 who are "wanted" for some reason or other. These portraits, which were photographed at the Prefecture of Police up to the beginning of this year, are of two kinds, full face and profile, and are each one-tenth of the life-size. To each is appended a description of the different features and of the figure as well, so that the Chief of the Anthropometrical Department has compiled a veritable dictionary, to which reference will be constantly made. But this is by no means his first work. Some of his volumes are being renewed, as they have been so thumbed and worn, and it is very noteworthy that, thanks to them, upwards of twenty-five persons of whom the police were in search were arrested last month. Owing to M. Bertillon's inventions, criminals can no longer hope to get off, and the number of those who continue to live in Paris, when they are forbidden to do so, is steadily diminishing.

FIRE EQUIPMENT AND HYDRANT STATISTICS

In Seventy-four U. S. Cities of from 12,000 to 20,000 Inhabitants

	Population, census 1900.	Area, sq. mi.	No. Fire Companies.				No. Firemen.			No. policemen.	Chief's Salary.		No. miles streets.	No. hydrants.	Ownership, water-works.	Hydrants cared for by—	Water department allowed for hydrants, or charge by private company, per year.
			Hose.	Truck.	Engine.	Chemical.	Paid.	Volunteer.	Call.		Fire.	Police.					
Alameda, Cal.	16,464	4	5	1	1	3	13	50	...	15	$1,500	$1,500	60	250	P	P	$12 hy
Ashland, Wis.	13,074	15	2	1	..	1	12	9	...	8	1,000	1,000	45	219	P	F	a
Ashtabula, O.	12,949	6	7	1	..	..	...	144	...	10	150	1,200	60	200	P	P	$7,525
Atchison, Kan.	15,722	8	2	1	1	1	8	6	...	†8	1,200	1,200	75	150	P	P	$40, 50 free
Alton, Ill.	14,210	8	3	1	..	*1	16	...	...	14	840	900	60	139	P	P	$60 hy
Ann Arbor, Mich.	14,509	6	2	2	1	*2	11	...	...	5	864	1,000	45	156	P	P	$40 "
Auburn, Me.	12,951	50	2	1	1	1	44	...	...	†7	200	840	250	116	C	W	$3,180
Belleville, Ill.	17,484	3	3	1	‡2	..	16	...	...	...	840	f 800	50	167	P	P	$12,420
Beverly, Mass.	13,884	15	4	2	3	..	105	...	...	22	300	1,100	58	286	C	W & F	.....
Bradford, Pa.	15,654	5	5	1	..	1	18	200	...	8	900	1,020	28	200	C	W	.....
Brookline, Mass.	16,164	10	3	2	2	*4	42	...	43	52	1,725	2,000	65	600	C	W	$25 hy
Cairo, Ill.	12,566	7	2	..	..	2	10	25	...	15	.....	....	...	211	C	W	$4,830
Charlotte, N. C.	18,091	4	3	1	1	1	16	...	12	28	900	1,200	65	170	C	W	$6,800
Chicopee, Mass.	19,167	26	5	2	*5	*5	8	...	100	12	1,000	1,200	84	211	C	W	$15 hy
Chillicothe, O.	12,976	4	3	3	3	1	13	1	...	14	900	900	...	155	P	C	$55 hy
Columbus, Ga.	17,614	3	2	1	3	1	29	...	...	36	1,200	1,500	55	157	P	P	b $9,790
Concord, N. H.	19,632	64	4	1	3	1	12	148	...	†11	c1,050	1,200	350	277	C	W	$6,000
Cumberland, Md.	17,128	2¼	6	1	1	..	...	...	...	15	.....	....	...	...	C	W	Nothing
Danville, Ill.	16,354	3¼	3	1	..	2	20	...	...	23	1,200	1,200	50	247	P	F & W	$40 hy
Danville, Va.	16,520	8	2	1	2	*1	33	20	...	21	600	900	29	200	C	W	.....
Decatur, Ill.	20,754	2½	3	1	2	2	26	...	...	18	1,200	1,200	65	316	C	W	.....
Dover, N. H.	13,207	25	3	1	‡3	..	68	...	...	12	300	1,000	150	175	C	W	$4,000
Elkhart, Ind.	15,184	6	5	1	..	..	10	46	...	13	900	1,200	...	225	P	P	$67.50 hy
Evanston, Ill.	19,259	6	3	2	1	1	28	...	...	20	1,500	1,500	102	488	C	S	Nothing
Flint, Mich.	13,103	6	3	1	‡2	..	18	...	...	4	900	1,000	...	195	C	W	$50 hy, d
Fond du Lac, Wis.	15,110	7½	3	1	2	1	19	...	...	11	900	1,200	125	218	P	P	$50 hy
Ft. Dodge, Ia.	12,162	4	3	2	..	..	...	...	...	7	200	900	50	...	C	W	.....
Gloversville, N. Y.	18,349	4	2	1	..	1	12	7	...	10	960	840	45	240	C	W	Nothing
Green Bay, Wis.	18,684	8	3	1	..	1	16	...	...	11	1,000	1,000	...	288	P	P	$37.50 hy
Hagerstown, Md.	13,591	3	4	1	2	1	10	250	...	6	.....	480	35	90	P	...	$2,350
Hannibal, Mo.	12,780	1½	2	..	..	..	11	...	...	†9	200	720	30	106	P	P	E
Homestead, Pa.	12,554	7	4	4	..	4	4	100	...	12	720	g	...	120	C	S	$50 hy
Jacksonville, Ill.	15,878	5¾	1	..	..	..	8	6	...	8	900	900	61	174	C	W	.....
Janesville, Wis.	13,185	7½	3	1	1	1	7	...	12	4	1,200	1,200	88	298	C	P	$7,000
Kankakee, Ill.	13,595	3½	4	1	..	1	2	40	...	9	150	900	60	148	P	P	$48 hy
Leavenworth, Kan.	20,735	8	2	1	..	*1	14	...	...	29	1,200	1,200	100	131	P	F	$75 hy, 5 free
Lockport, N. Y.	16,581	4½	5	1	..	1	5	200	...	14	150	1,000	100	500	C	W	.....
Lorain, O.	16,028	10	4	..	1	..	4	36	...	15	300	1,200	67	340	C	W	Nothing
Madison, Wis.	19,164	7	2	1	..	1	13	...	19	12	900	1,200	60	200	C	W	$10,000
Mahanoy City, Pa.	13,504	¼	3	1	‡3	*2	...	650	...	4	h50	780	9	...	P	C	$100 hy
Mansfield, O.	17,640	16	3	1	1	1	15	12	...	13	600	900	150	220	C	F	Nothing
Marion, Ind.	17,337	6	6	1	..	1	17	25	3	22	800	1,100	...	240	C	W	.....
Marlboro, Mass.	13,609	10	4	2	..	..	57	...	...	9	350	1,000	95	342	C	W	$20 hy
Medford, Mass.	18,244	9	2	1	1	*3	10	...	46	20	952	1,300	65	446	C	W	$5,000
Menominee, Mich.	12,818	6	3	1	..	1	12	...	...	5	1,200	900	25	260	P	P	$780
Middletown, N. Y.	14,522	3½	5	1	..	1	...	479	...	10	100	800	50	298	C	W	Nothing
Moline, Ill.	17,248	3½	2	1	..	..	11	...	...	13	1,000	1,200	54	250	C	W	.....
Nanticoke, Pa.	12,116	..	5	1	..	..	...	...	110	2	100	660	...	...	C	F & W	$12.50 hy
New Brunswick, N. J.	20,006	10	7	1	6	..	...	500	...	14	110	1,000	...	231	C	W	$11,550
Newburyport, Mass.	14,478	3	2	1	3	..	2	79	...	12	300	1,200	30	87	C	W	Nothing
Niagara Falls, N. Y.	19,457	10	4	2	..	1	19	75	...	26	900	1,000	75	750	P & C	W	k
Northampton, Mass.	18,643	39	4	3	2	1	7	...	79	11	1,000	1,200	200	303	C	W	Nothing
Ogdensburg, N. Y.	12,633	5	1	..	2	1	25	...	...	6	900	780	75	150	C	W	"
Ottumwa, Ia.	18,197	9	1	1	..	..	11	...	...	26	800	1,000	125	186	P	F	$10,800
Owensboro, Ky.	13,189	2¼	2	2	..	1	13	...	...	16	720	720	150	...	P	C	.....
Paducah, Ky.	19,446	12	3	2	1	1	20	...	...	25	.....	....	...	332	P	F	$25 hy
Perth Amboy, N. J.	17,699	5	3	1	..	..	...	...	...	14	.....	....	...	205	C	F	$10 hy
Pittston, Pa.	13,264	4	1	..	2	..	2	175	...	5	100	900	...	40	P	..	.....
Portsmouth, O.	17,870	3	..	..	2	..	15	...	..	14	1,000	1,200	40	195	P	W	Nothing
Pottsville, Pa.	15,110	2	1	1	4	l 2	...	760	...	10	100	780	35	142	P	F	"
Richmond, Ind.	18,226	4	3	1	..	..	16	...	...	16	1,100	1,000	61	300	P	F	$16,141.34
Rock Island, Ill.	19,493	7	3	1	..	..	17	...	...	20	1,000	1,035	30	195	C	W	Nothing
Rome, N. Y.	15,343	3 1-3	3	1	2	..	15	40	...	8	840	900	35	242	C	W	"
Sandusky, O.	19,664	7½	3	1	‡2	1	34	...	...	18	1,000	1,200	...	...	C	W	"
Sedalia, Mo.	15,231	6¼	2	..	..	..	10	...	...	7	900	900	240	187	P	P	$40 hy
Shamokin, Pa.	18,202	4	3	..	1	1	...	500	...	6	900	720	30	63	P	C	Nothing
Steelton, Pa.	12,086	2	2	1	1	..	...	300	...	1	25	60	20	105	C	C	$30 hy
Stamford, Conn.	15,997	7	2	1	2	1	50	...	...	†14	300	1,200	65	144	P	F	$20 hy
Streator, Ill.	14,079	3½	1	..	..	..	6	...	...	13	720	900	60	237	P	..	m
Steubenville, O.	14,349	6	2	..	..	..	10	...	...	10	960	1,000	35	260	C	F	.....
Stillwater, Minn.	12,318	4	1	1	1	1	8	...	6	9	900	1,140	...	132	P	P	$80 hy
Wilmington, N. C.	20,796	3½	2	1	1	1	33	...	...	38	1,200	1,200	50	115	C	P	$6,750
Winona, Minn.	19,714	10	4	2	1	1	31	...	...	19	1,320	1,350	75	346	C	..	.....
Woburn, Mass.	14,254	10	6	1	*1	..	66	...	...	15	500	1,200	68	361	C	W	.....

P Private water company. C The city. F Fire department. W Water department. S Street department. * Included with hose company, or a combination chemical and hose company. † And specials: 5 in Auburn; 50 in Concord, with 15 reserve men; 12 in Hannibal; 32 in Stamford. ‡ Engines only, no engine companies. a 54 @ $100, 46 @ $60, 119 @ $50. b 50 @ $80, 50 @ $75, 57 @ $40. c And house rent. d City just purchased works; private company charged $65 for first 100 and $50 for rest. e 100 @ $50, 6 @ $40. f And constable's fees. g $2.75 per day. h Fire marshal. k Two systems; $35 hy. allowed by city, $35 hy. charged by company. l Combined with engine companies. m $42.50 for first 112 hydrants, $35 for rest per year.

WHAT POLICE AND FIREMEN ARE DOING

Fire Congress This Summer at Budapest—Harrisburg Needs Paid Force—Explosion of Smoke—Fire and Police Personals

Fire Congress at Budapest

ON August 17-21 there is to be held at Budapest, Hungary, an international fire congress under the auspices of the International Union for Protection Against Fire. An exhibition of fire extinguishing and safety devices will be given and the Hungarian Ministry of the Interior desires that foreign countries be represented. The following classification for lectures on fire subjects has been made: Fire prevention, fire police, causes of fire; means of extinguishing fires; water supply; fireproof buildings, material, life saving, electricity in the service of fire police. The lectures will be held in German, French, Hungarian or English language. Count Széchényi Victor is president of the Union at Budapest.

Enforcement of New Rules Gives Better Discipline

THE report of Chief J. W. Miles, of the Williamsport Fire Department, stated that the rules passed last year have resulted in better discipline. The continuous watch kept on the first floor of fire stations gives quicker response to alarms. The total fire loss was $26,511.67, with $24,053.20 insurance paid. The alarms amounted to 130, of which fourteen were false and one outside the city. Considerable equipment was purchased during the year, including 1,800 feet of hose, a Schneider hose shut-off, and extinguishers. The hydrant pressure being heavy, the steamer was little used. He said that, considering the number of fires extinguished in their incipiency by the chemical engines, all companies should be equipped with them, to take the place of simple hose wagons. A life net was recommended, as well as more hose.

Paid Department Wanted for Harrisburg

A PAID department is called for by Chief G. W. Lutz in his annual report to the Harrisburg, Pa., Councils. He claims that, though the volunteers are willing and render good service, the system is wrong and has outlived its usefulness in a city the size of Harrisburg. He held that at a fire of any duration, the men get tired playing at firemen and quit because they are not paid for their work. He considers that a paid department is a serious matter and should be strictly a business proposition. Another strong point in the Chief's report is regarding the overhead wires. He said that nothing has been done to mitigate the evil which is becoming worse each year. He urged that the wires be placed underground, for it is almost impossible to raise the aerial ladder in business streets because of them, while the danger to life from the heavy electric currents is very great. The Chief recommended a number of repairs to apparatus, the purchase of a steamer and 10,000 feet of hose that "will neither rot, mildew nor freeze," the company furnishing it to guarantee the hose for six years.

Lowest Fire Loss in Sioux City

DURING the past year the fire losses in Sioux City, Ia., were lower than at any time in the history of the city, when the number of alarms is considered. Chief George M. Kellog, of the Fire Department, reported the total losses at $32,179.48, the net loss over insurance being $5,358.73. The Chief recommended that a new steam engine be purchased to supplant the old one. He also recommended a Vajen-Bader smoke protector, another Eastman deluge set, and a new chief's buggy. More hydrants are also needed. The Chief and his assistants have made inspections of buildings and have ordered a large number of fire escapes erected. During the year 192 alarms were answered. The electrical inspector was commended, as the Chief considers that he prevented many fires. The Department includes four hose wagons, a combination chemical wagon, three chemicals, a truck and an aerial truck, a Silsby steamer, a Silsby two-horse hose truck, four supply wagons, an electrical wagon, and 400 feet of hose. The manual force consists of thirty-five men.

Successful Year in Scranton Fire Department

THE past year in the Bureau of Fire of Scranton, Pa., is considered the most successful of any year by Director Mark K. Edgar, of the Department of Public Safety, because of the good work of the firemen in checking fires in their incipiency. A large amount of new apparatus was purchased, including 2,700 feet of hose, a deluge set, and thirty-six hydrants. The leases of the fire alarm system from the Gamewell Company having expired and the telephone company having refused longer to maintain the system, the Director urged that appropriation be made for putting in an alarm system for both fire and police departments. The sum of $48,000 is the estimated cost of these systems. A chemical engine should be purchased and the pay of the firemen should be increased. At present a man receives but $50 for the first, and $60 a month for succeeding years. An abolition of call men and the substitution of paid men throughout the department would result in better service. The system of daily fire reports to the Director has proved valuable.

More Apparatus Needed in Shreveport

THE purchase of 1,000 feet of hose, a second size steamer, and the retirement of two hose reels in favor of two hose wagons, were recommended by Chief Chris O'Brien, of the Shreveport, La., Fire Department. The maintenance of the Department for 1904 was placed at $30,500 without any additions. In 1903 the Department responded to 170 alarms of fire, of which ten were false and one out of town. The total loss on buildings and contents amounted to $191,891, on which $138,391 insurance was paid. The number of streams used on fires was 110 and 610 gallons of chemicals were employed. The growth of the city has made necessary

the location of additional apparatus in certain sections in the near future. The Chief spoke well of the work of the Gamewell storage battery system that superseded the gravity battery. A systematic inspection of buildings has been made by the Department members with the best of results. The work done in the repair shop has justified its installation, as not only was money saved, but the work turned out was better than could have been done outside. At the time of the report, the Department consisted of a Seagrave aerial truck, a village truck, three steamers, a Holloway and a Champion combination wagon, two hose reels, and a buggy. In reserve are held two hose and a coal wagon. The *personnel* consists of thirty-four.

Analysis of Work of Fall River Police

THE report of the Police Board of Fall River, Mass., is always interesting because of the analysis of arrests and crimes coming under its jurisdiction. The number of arrests for 1903 was 4,679, a decrease of 5.8 per cent. over 1902, but an increase of 9.1 per cent. over the average for eight preceding years. The number for 1903 was 4.13 per cent. of the population, but a trifle less than the percentage for the eight years past. More than one-half the arrests for offences against property were by minors. The percentage of foreigners to the population is 47.7, but the number of arrests of foreigners was 59.27 per cent. of the whole. Of the total arrests, 52.82 per cent. were between the years of twenty and thirty-nine. For drunkenness the arrests numbered 2,456, or 2.16 per cent. of the population, a decrease of 386 over 1902, but an increase of 6.46 per cent. over the preceding eight years. Of the number, 65 per cent. were of foreign birth. There was an increase of 78.5 per cent. of juvenile offenders, 24.7 per cent. of whom were foreigners, and 77.6 per cent. of whose parents were of foreign birth. Fall River has an average of about one saloon to every 1,000 inhabitants, and the total received from the 104 saloons amounted to $206,241, of which 75 per cent. was the city's share.

Smoke Does Explode

IMMEDIATELY after the Baltimore conflagration it was stated by District Chief L. H. Burkhardt that in his opinion it was due to an explosion of smoke, with which the cellar of the Hurst building was charged. This was ridiculed by many, who said that smoke was not explosive.

Mr. William McDevitt, inspector of the Philadelphia Fire Underwriters' Association, has demonstrated that such explosions are due to smoke, and demonstrated this fact to the Baltimore officials, as he has done to others in the past. He said in part: "What is smoke? In the burning of nearly all inflammable substances (say wood) there is never what is termed complete combustion, as much of the combustible matter escapes unburned in the form of *gases* and *free carbon*, and as they rise from the heat, become cooled and condense in a cloud which is called smoke. Now, the component parts of this "smoke" consist of *gases* and free carbon, and if secured or confined and kept heated and become mixed with oxygen a highly combustible and explosive mixture is formed if ignited.

In a burning building, with the fire burning below, the smoke ascends and the action of the heat produces an expansive effect, causing the smoke to be forced downward and if becoming ignited by contact with the flames below or by an ascending burning cinder a wave of fire is produced, the force depending on the proportion of oxygen present with the volume of the smoke, or if the heat reaches a temperature of seven or eight hundred degrees the gases ignite of themselves, as all inflammable gases ignite at given temperatures without flame being applied.

Fire and Police Personals

—Hon. Edward H. Fowler, police commissioner of Baltimore, Md., died on March 9 of apoplexy.

—Chief Calvin C. Dow has been re-elected as the head of the Fire Department of Waterville, Me.

—William Black is the new chief of the fire department of Atlantic City, N. J., which was finally installed the last part of March.

—Chief of Police Bollingsworth of Missoula, Mont., has been suspended by Mayor Smith for disobedience of orders, and this action has been sustained by the Council, whose committee found the charges correct.

—Chief Musham, of Chicago's Fire Department, has favored the introduction of automobile fire engines in his city. He thinks the city should begin to adopt horseless engines, as the saving in feed and horses would be considerable.

—Superintendent Kruger of the Indianapolis Police Department has introduced military regulations in the force. A rigid inspection of uniforms and arms will be held every morning. Each man is to be supplied with a daily bulletin telling of crimes committed, men wanted, missing people, etc.

—Chief W. R. Joyner, of Atlanta Fire Department, has announced that he will be a candidate for mayor of his city in 1907. Chief Joyner will then have served twenty years in the fire service as its head and has promised his family to resign. He was asked to run for mayor this year but declined to do so until the twenty years was up.

—Mr. Samuel F. Hunter was appointed chief of the Fire Department of Springfield, O., by Mayor Bowlus April 1, to succeed George Follrarth, who resigned. Chief Hunter, on taking charge, issued a set of rules to bring good discipline into the department. Strict obedience to orders of officers must be given by the men. Ladder practice must be held regularly, and the captains must, in turn, spend a day in examination of all buildings. Hereafter fire lines are to be formed by the police and no one allowed in a burning building except the firemen.

—Chief Hederman, of Hornellsville, N. Y., Fire Department, has suggested to the chiefs of departments in neighboring cities and towns that it was for the interest of all that they meet to talk over the question of a standard hose coupling to fit the hydrants in all the towns, or a combination coupling that would fit the hydrants and hose of the different departments, as at any moment assistance may be asked from some town by the chief of another. The question of urging upon the citizens in towns where gravity pressure is used for fire fighting, the necessity of keeping an engine in reserve should also be discussed. Chief Hederman received hearty approval of his plan.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

Books

The recent disaster at the Iroquois Theater in Chicago prompted all cities to overhaul their building laws, to make new ones to fit the new conditions and to correct such mistakes as this fire pointed out. A study of the theater fires and panics in the past—the loss of life being due to the panics more than to actual death by burning—should be made by those having the framing of new building laws in hand and they could do no better than to read *Theater Fires and Panics: Their Causes and Prevention,* by William Paul Gerhard, C. E., who has made these disasters a study. This little book discusses the causes and prevention of panics and fires in theaters and is composed mainly of a number of essays prepared by the writer at different times. The first chapter takes up theater fire statistics, the causes of these fires and panics, the measures to prevent these catastrophes, and theater management and inspection. Chapter II. talks about the "Essential Conditions of Safety in Theaters," and deals with the general plan and construction of these structures in detail, including measures for prevention and extinguishment of fires. Chapter III. takes up "Water Service and Fire Protection of Theaters" including the general requirements of safety in theaters and further appliances for extinguishing fires. A long list of books and pamphlets in French, German, English and Italian, dealing with theaters, is appended. Cloth, 12 mo., pp. 175, $1.50, postage 7 cents. w.

Municipal government is the great problem of this age. The solution depends in great measure on the honest thought and study brought to bear upon its many sub-problems that are ever being presented to the citizen. In America, the indifference of the great mass of citizens to these problems greatly retards the rapid solution that is in accordance with American progressiveness. An attempt to answer some of the municipal and governmental problems, such as are met with at all times, is made by Professor Frank Parsons in *The City for the People.* To support his statements and conclusions, Prof. Parsons has presented a mass of facts and figures, giving specific instances to prove his case and not making general statements. He has drawn freely on public documents, the works of authorities on different municipal problems, testimony in legal cases, etc., and the reader, while possibly not agreeing with the author, will be compelled to admit that he has treated his subject fairly, weighing the arguments of both sides. The chapters that will be of especial interest to the city officer are those on "Public Ownership," "Home Rule for Cities," and "Preferential Voting." The other chapters are devoted to "Direct Legislation," "The Merit System of Civil Service," "Proportional Representation," "The Automatic Ballot," "Best Means of Overcoming Corruption," and "Legislative Forms" which includes present and proposed legislative forms for different subjects, suggestions for a model charter, etc. A full index of subjects concludes the volume.

While the book is strongly written and the conclusions drawn by the author are at times rather radical, the opponent of municipal ownership and home rule will have much work cut out for him in attempting to answer the array of facts the author presents in support of his position. We recommend this work to all city officials as it cannot fail to prove of the greatest value in their work on account of the mass of information contained. Cloth, 703 pages, $1 net; postage 20 cents. cft.

The work that the Civic Improvement League of St. Louis is doing with its playgrounds is told in a most interesting manner in the report of the Open Air Playgrounds Committee of that association. The true value of these playgrounds to the municipality cannot be told in figures. It is one of the purposes of the League to prove by its work what such grounds do for the children of the city in building up their health and causing crime to diminish, so that, in the end, the city will establish its own playgrounds and maintain them as training places for the younger generation. The League also recommends that the city keep the schools open for recreation centers and maintain playgrounds in connection with the schools during the summer, and that public baths be conducted in connection with small parks and playgrounds. The report contains an analysis of the conditions in the North End, where the grounds are located, showing the character of the population, etc. The League runs six bath houses, which are greatly appreciated by the children. The expense and labor of erecting the houses and putting the grounds in condition was borne by voluntary contributions of both money and labor from many citizens. The police have testified to the good the grounds have done in keeping the children off of the streets and out of temptation to commit crime. Mr. Dwight F. Davis is the chairman of the committee.

Towers and Tanks for Water-works, by J. N. Hazlehurst. The theory and practice of their design and construction. Second edition, revised and enlarged. Cloth, 8vo, 325 pp., 60 cuts, $2.50 net, postage 15 cents. w.

The Oligarchy of Venice, by George B. McClellan, mayor of New York. An essay. 216 pp., $1.25 net. h.

New Tables. For the complete solution of Ganguillet and Kutter's Formula for the flow of liquids in open channels, pipes, sewers, and conduits. By Col. E. C. S. Moore. Cloth, 8vo., 231 pages, $5 net, v.

Tables. Showing the loss of head due to the friction of water in pipes. By Edmund B. Weston, C. E. Flexible leather, 171 pages and folding tables, $1.50 net. v.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

The History of Village Improvement in the United States is a small booklet by Warren H. Manning and is reprinted for *The Craftsman,* February, 1904.

Periodicals

The issue of *The Municipal Journal* of London for March 18, 1903, contains a leading article on *Brighton Municipal Telephones,* describing this successful undertaking. No charge was made for using the 'phones to the subscribers until 750 were installed, but now a charge of $27.50 is made for unlimited service, a limited service being secured for $17.50 and 2 cents a message. Other rates are also made for different services. Price per year, 8s. 8d.

The seventh in a series of nine articles on "The Civic Renaissance," by Prof. Charles Zueblin, appeared in the March *Chautauquan* under the title of *The Harrisburg Plan,* telling of the work of improving that city. Springfield, O. Price, $2 a year.

The March issue of *The Annals of the American Society of Political and Social Science* is devoted to municipal problems. Henry J. Ford contributes *Principles of Municipal Organization;* Adna F. Webber writes on *The Significance of Recent City Growth;* Herbert M. Adler on *Recent Changes in the Government of London;* B. R. Gelling on *The Municipal Institutions of Australia;* Homer Folks on *Problems in Administration of Municipal Charities;* Hugo S. Grosser on *Municipal Problems of Chicago;* R. W. Deforest on *Recent Progress in Tenement House Reform;* Ernst J. Lederle on *New York City's Sanitary Problems and Their Solution,* and R. H. Whitten on *Political and Municipal Legislation in 1903.* Philadelphia, Pa. Price per year, $6.

The March *Arena* has, as a leading article, *A Forgotten Remedy Against the Telephone Monopoly,* by John Brooks Leavitt, which consists in amending the patent laws so that for the next fifteen years no invention in telephony can be made. This would allow patents to run out and the government should then undertake to supply the service. New York, N. Y. Price per year, $2.50.

A number of interesting illustrated articles appear in the issue of *Public Works* for February 15. *Sheffield Municipal Tramways* are described by C. F. Wike, C. E., city engineer of that city. *Municipal Melbourne* is described by A. C. Mountain, C. E.; *Municipal Chicago* by John Ericson, and there is an article with fine illustrations of the *High Pressure Fire Service of Philadelphia.*. London, Eng. Price per pear, 18s.

The Penalty Clause in Engineering Contracts. Letter by W. A. Stevenson to the *Engineering News,* New York, March 24, 1904.

Gas Engines for Pumping in Proposed High Pressure Fire Service in Chicago. Engineering News, March 3, 1904.

Cement Production Statistics (U. S. report), by Ed. C. Eckel. *Engineering News,* New York, February 25, 1904.

Gas Engines at Konigshoff and Kustrin, Ger., by Frank C. Perkins. *Gas Engine,* March 4, 1904.

Crime and Its Suppression, by J. J. Kelso. *The Canadian,* March, 1904.

The Administrative Control of Tuberculosis, by Hermann M. Biggs, M. D., in *Medical News,* February 20, 1904.

Cost of Lighting Streets in Berlin. Progressive Age, New York, March 15, 1904.

Rust of Steel Prevented by Concrete, by Charles L. Norton. *Progressive Age,* New York, March 1, 1904.

Gas Statistics of Austria Hungary. Review of official report. *Journal of Gas Lighting,* London, Eng., February 9, 1904.

Thawing of Water Service Pipes by Electricity at Altoona, by E. B. Greene. *Electrical World and Engineer,* New York, February 13, 1904.

Floods and Flood Prevention Works at East St. Louis, Ill., by J. F. Parr. *Engineering News,* New York, February 4, 1904.

An Account of the Baltimore Fire with Some General Deductions, by H. D. Brush. *Engineering Record,* New York, February 20, 1904.

Detail Studies of Fireproof Buildings in the Baltimore Conflagration. Engineering News, New York, February 25, 1904.

Iroquois Theatre Fire, by F. T. J. Stewart. *Insurance Engineering..* New York, January, 1904.

Steel Structures in the Baltimore Fire. Iron Age, New York, February 25, 1904.

Tunneling Machine: Great Northern, Picadilly and Brompton Railway. Engineering, London, February 5, 1904.

Concrete Hollow Wall Construction. Mining and Scientific Press, San Francisco, January 30, 1904.

More Light on the Theory of Concrete, by Spencer B. Newberry. *Engineering Record,* New York, February 6, 1904.

The Siegwart Ferro-Concrete Floor Beams. Engineering, London, January 29, 1904.

Inaccuracy in Some Engineering Approximations; Formulas for Elevation of Outer Rail on Curves, by W. D. Taylor. *Engineering News,* New York, February 18, 1904.

The Sanitation and Proposed Sewerage System of Havana, Cuba, by A. E. Carter. *School of Mines Quarterly,* New York, November, 1903.

Concrete Foundation and Cement Filler for Brick Pavement, by O. L. Gearheart. *Engineering Record,* New York, February 13, 1904.

Maintenance of Asphalt Pavements in Washington, by Capt. H. C. Newcomer. *Engineering News,* New York, February 18, 1904.

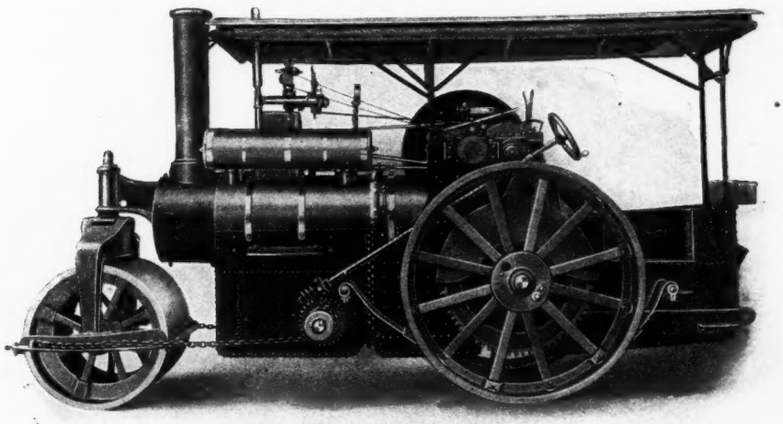
Sewage Testing Apparatus. The Engineer, London, February 12, 1904.

Water Softening, by J. O. Handy. *Proceedings of Engineering Soc. of West Penn.,* Pittsburg, Pa., December, 1903.

Electrolysis as Caused by the Railway Return Current, by Albert B. Herrick. Remedies for this trouble. *Street Railway Journal,* New York, April 2, 1904.

SPRINGFIELD STANDARD AND TANDEM ROLLERS

For all kinds of road making, including the rolling of macadam, gravel or dirt roads, plowing or spiking up the surface of worn out roads, rolling foundations of all kinds of pavements, rolling fills or embankments, or driving a stone crusher, the Springfield Standard steam roller is well adapted. This machine may also serve as a traction engine to haul broken stone. As five sizes of these machines are kept in stock—viz., 20,000, 26,000, 30,000, 35,000, and 37,000 pounds weight respectively—a wide range in weight is ready for selection. The advantages claimed for these machines are many, but one of the most important is the beveled driving wheels of large diameter. The advantage of wheels of large diameter are that they roll much easier and so require less power to start or propel them, they will pass over obstacles readily, they will not crowd loose material ahead or to the sides as do small wheels, and the large diameter gives greater wearing surface on the circumference. The patent beveled wheels are an especial advantage on highly crowned roads. Wheels with flat tires come in contact with the road surface, where the crown is high, at their inner edges, thus producing a sharp depression on the loose material and causing ridges to form. With the beveled tires, the whole weight is distributed evenly over the road under the tire and the depression is uniform. On all these rollers the width of the driving wheels may be increased or diminished so as to increase or diminsh the compression desired.

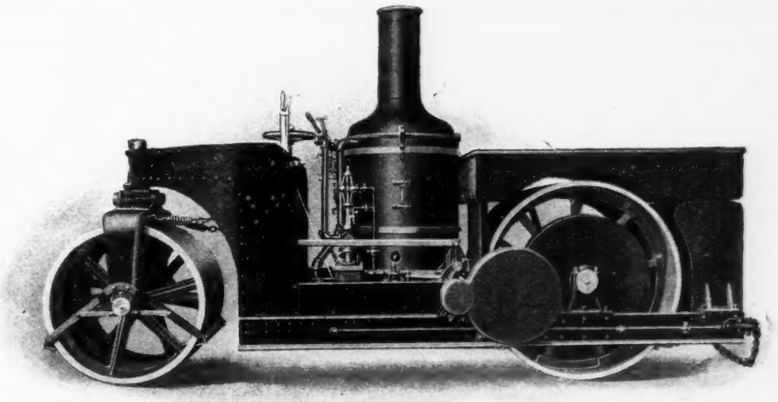


SPRINGFIELD STANDARD MACADAM ROLLER

Spikes may be fitted into the tires of the rear wheels when it is desired to break up the surface of roads, and the Company is prepared to furnish wheels with corrugations for rolling embankments.

A steam steering gear is attached to the larger sizes of these rollers, but the steam gearing may be readily detached and hand steering substituted. Cast steel is used instead of cast iron. The machine is so arranged that it can work forwards or backwards on steep grades.

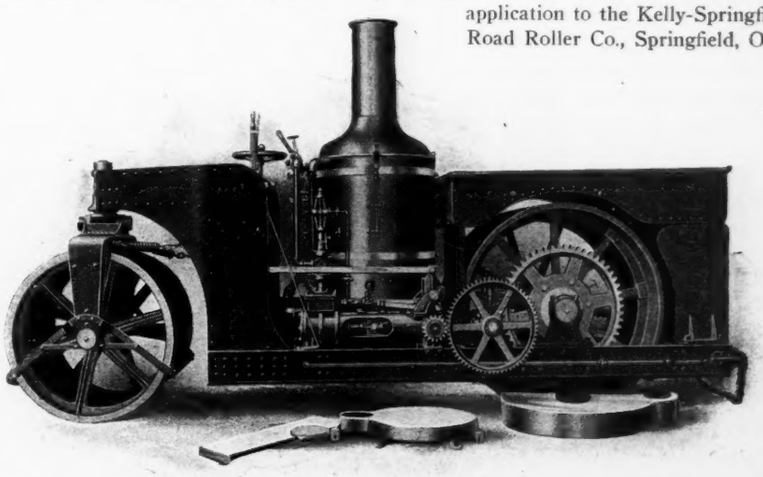
"Tandem" is the name the Company attaches to its two-wheeled rollers, which are made in two styles, one having horizontal engine and spur gear, and the other vertical engine and beveled gear. The former is made in six sizes, from three and one-half ton to ten tons. The larger may be used for plowing or hauling and all are equipped with band wheel for driving machinery. They will work on grades as great as 25 per cent., or sidewise on a similar grade without danger of upsetting. The gearing is of the best cast steel, the driving pinion shaft lies in two long bearings, and the crank shaft and intermediate gears are cut from solid steel castings. Each roller is fitted with a water tank large enough for five hours' continuous work, and the coal bunker will carry a day's supply. The vertical engine style of these tandem rollers is not fitted with band wheel, and only five and six-ton machines are kept in stock. Any of the tandem rollers may be fitted with cleats for embankment rolling.



LEFT SIDE OF SPRINGFIELD TANDEM ROLLER

The fore carriage is very strong and the steering gear gives the largest possible range of movement to the front wheels, and is especially adapted to meet all requirements for steering over rough as well as smooth surfaces. The double, high pressure, reversible engines fitted to these rollers, are carried horizontally on the main frame. All bearings are adjustable and the engines are in plain view of the engineer and are independent of the boiler and easily reached from the ground. The five and six-ton sizes are designed especially for rolling asphalt, but, of course, are available for other purposes. Larger size rollers of this type may be obtained if desired, but are not kept in stock. All these tandem rollers have surplus power and so, where a greater compression is desired than the ordinary weight of the machine, it may be weighted without materially adding to the cost of operation. Two of the accompanying illustrations show this type of roller with and without the shields covering the gears and engines.

Full description and particulars of these rollers will be sent on application to the Kelly-Springfield Road Roller Co., Springfield, O.



SPRINGFIELD TANDEM ROLLER—SHIELDS REMOVED TO SHOW GEARS AND ENGINE

MUNICIPAL WAGONS OF QUALITY

It is said that great things have small beginnings, and certainly this is carried out in the case of the Studebaker factory shown in the accompanying illustration. The origin of these large works was a roadside blacksmith shop where the elder Studebaker, many years

STUDEBAKER SPRINKLER—VERTICAL ATTACHMENTS

ago, supplied the needs of the country round. On the site of this shop stands a series of large buildings covering a space equal to several city blocks and equipped with the very newest machinery, manned by skilled labor. While the Studebaker Bros. Manufacturing Company puts out a large line of goods, a large proportion of the plant is devoted to municipal appliances—sprinkling wagons, dump carts, etc., being the products of interest to city officials. Careful study of the sprinklers, sweepers, etc., in their many parts through all the years the firm has been making them, has been rewarded with machines that are as near to perfection as possible.

At the present moment the Company is devoting considerable attention to giving publicity to its Niagara street sprinkler, claiming the following points of advantage: First, the patent Niagara slot valve or sprinkler head, made of brass, which cannot clog or rust. Trash cannot accumulate in it, but passes through the slot and out with the water, as there is no obstruction to catch it; second, the simplicity of the device. There being nothing to get out of order, the sprinkler is free from complications in all its parts, and is simple in its construction; third, the sprinkler is easy to understand. The valves are operated by only two foot levers, throw any number of grades of spray, from the lightest to the heaviest, there being two distinct valves, one located in the rear of each wheel, connected with the tank by four-inch rubber discharge pipes. The driver may at will use either side independent of the other. The valves are so constructed that, by a simple adjustment of either or both, a heavy stream may be thrown on one side and a light spray on the other, or any other desired combination; fourth, an unequaled width and evenness of spray; fifth, all parts are interchangeable. In case of accident it is a simple matter to secure repairs; sixth, in the improved Studebaker Sprinkler the discharge pipes are fed from a single large opening, affording the greatest pressure possible to be obtained. These advantages are combined with the well known easy draft of the Studebaker vehicles, together with their scientific and substantial construction.

The Company is also dwelling at considerable length upon the merits of its vertical spray sprinkler, which possesses the following characteristics: The width of the spray is controlled by a slight motion of the driver's foot, as all of the vertical spray sprinklers are fitted with a patent controlling device. Each head operates independently of the other, so that the width of the spray can be reduced on either side of the wagon as necessary in driving through narrow streets or on crowded thoroughfares. There is an even flow of water that will sprinkle the street underneath and close to the wagon, as well as when the valves are in full operation. The sprinkler heads are so arranged that the volume of water can be

STUDEBAKER SPRINKLER—NIAGARA ATTACHMENTS

controlled, enabling the driver to throw a light spray for street sweeping, or a medium or heavy spray for the regular work of dust laying. All of this is controlled easily by the foot of the driver. The water is thrown in a straight line across the street, the patent adjustments enabling the driver to sprinkle close to the cross-walks but leave them entirely dry, as the valves are so constructed that no water drips from the heads when the valves are closed. Pedestrians are not in danger of a wetting.

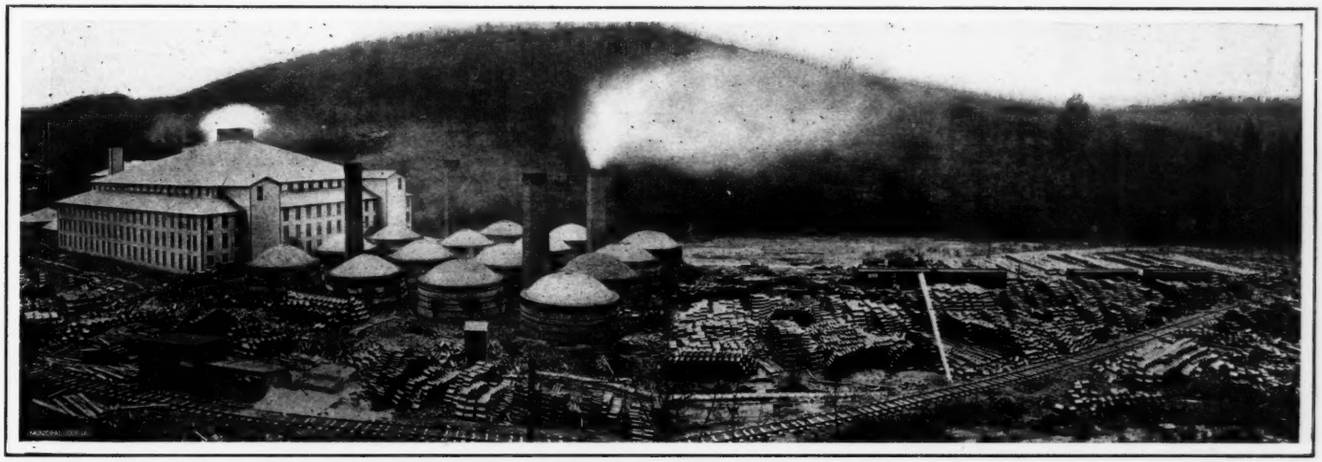
Catalogue No. 217, issued by the Studebaker Company, is devoted to municipal appliances, giving a very comprehensive list of this line. A request to the Company at South Bend, Ind., will bring one of these booklets for inspection.

VIEW OF STUDEBAKER VEHICLE WORKS

A New Sewer Pipe Plant

One of the newest of the recent new sewer pipe plants is that of the Duquesne Fireproofing Company, located at West Winfield, Butler County, Pennsylvania, about forty miles from Pittsburg. The plant was originally designed for the manufacture of fireproofing blocks and face brick, but some experimenting on the part of the management showed the fire-clay deposit to be peculiarly adapted for making a very high-grade sewer pipe. In consequence the officers of the company swung the plant over to the manufacture of sewer pipe exclusively, and are now operating their works on this line of product.

The plant, as shown in the accompanying illustration, consists of one main four-story building, with slate roof, in which are contained the sewer pipe presses, brick machine, etc. This building has a drying floor space of about three acres in extent, is well lighted, and is heated throughout with steam. In fact, no fire is used in the building, the boilers being placed in a detached brick building made as nearly fireproof as possible. All the machinery of the plant is of the newest and best construction, and has been selected with great care by experts, with a view to the highest efficiency. It consists of four horizontal tubular boilers of 100 H. P. each, built by Munroe & Company, of Pittsburg; one Allis-Chalmers Corliss engine of 300 H. P.; two Stevenson dry pans; two Stevenson wet pans; with clay elevators and Dunlap Perfection screens; two power elevators; four gravity elevators; Stevenson sewer pipe presses; Bonnot brick machine, etc. There are fifteen thirty-foot down draft beehive kilns arranged so as to be used either with coal or with natural gas.



VIEW OF PLANT, KILNS AND YARD OF DUQUESNE FIREPROOFING CO., WEST WINFIELD, PA.

The company owns a tract of ten acres on which is located the works and the sewer pipe yard and, in addition, it has control of a large tract of mineral land adjoining, containing two veins of coal, each underlaid with a fine vein of fire-clay—one vein of fire-clay running from eight to ten feet in thickness and the other from twelve to fifteen feet. The upper vein of clay is known as the Lower Kittanning Fire-clay and is the one from which the famous Kittanning buff brick are made. The lower vein is known as the Clarion vein and is of the same grade of clay from which the Clarion fire-brick are made and which are well known all over Western Pennsylvania.

In addition to the above mineral resources, the company has a very advantageous contract for its natural gas supply delivered at its plant, the works being located in the midst of a natural gas district.

The company, through its railroad connections, has excellent shipping facilities, its president owning the controlling stock in the branch railroad penetrating the property and thus giving good connections with the great Pennsylvania Railroad System.

The company, although in operation for less than twelve months, is now producing a high-grade article of sewer pipe, which it is claimed, is excelled by none of the older factories. The capacity of the works is over 100 cars per month.

The officers of the Duquense Fireproofing Company are all well known Pittsburgers. The president, Frederick W. McKee, is a member of the Pittsburg bar, and is president of the Winfield Railroad Company. Mr. E. J. Frauenheim, the vice-president, is the City Treasurer of Pittsburg. The secretary and treasurer, Sion B. Smith, Esq., is also secretary and treasurer of the Winfield Railroad Company. The general manager, Mr. George H. Albertson, is a well known brick manufacturer of Pittsburg and for upwards of eighteen years was manager of the great Booth & Flinn brick works. The other officers and directors of the company are: S. W. Cunningham, Esq., attorney for the company and formerly a member of the law firm of Chantler, McGill and Cunningham; A. W. Duff, Esq., also a member of the Pittsburg bar and president of the First National Bank of Wilkinsburg, Pa.; Charles A. Fagan, Esq., of the law firm of Fagan & Magee and attorney for the Pittsburg Brewing Company and the German National Bank, and James Carothers, of the firm of Jas. Carothers & Company, bankers and brokers.

The Duquesne Fireproofing Company's city offices are located in the Germania Savings Bank Building, 421 Wood Street, Pittsburg, Pa.

No Slipping on Bitulithic Pavement

A recent issue of the *Auto Era* contained the following concerning the automobile and asphalt streets:

"A recent article in one of the trade journals strongly advocated asphalt paving upon city streets as best for automobiles. May we be pardoned for having a contrary opinion? When an asphalted street is dry it affords means of good traction, and satisfactory going. But asphalt is seldom dry on account of sprinkling carts which patrol city streets continuously during most months in the year. When it is wet, there is nothing so treacherous. Side slipping cannot well be guarded against, and when you skid at corners and on slippery down grades there is danger not only to machine and operator, but to general traffic. One of the greatest dangers of asphalt pavement is when going along at a moderate, or any other speed above the 'very slow,' and there appears some sudden obstruction upon the roadway to necessitate the hard application of brakes. If the machine is of some weight, and having rubber tired wheels, the clamping of brakes and the locking of wheels will not check the momentum of the automobile, and on it goes, slipping and sliding in the general direction being followed at the time the brake was set. The reason is there is no grit upon the wet asphalt surface. It is 'greasy' and affords no resistance to sliding rubber tired wheels."

Here is where the gritty surface of the bitulithic pavement comes in, for it affords a superior foothold for horses as well as one for rubber-tired vehicles. In the report of a committee of the Road Drivers' Association of New York City, it is stated that, on driving horses over a stretch of bitulithic pavement, it was found "that the foothold for horses was as good as a new and well built macadam

road in perfect condition." Another report by a committee of the Associated Road Users of America contains the statement that, "When wet the surface seemed just as good hold as the surface of a new macadam road. There could be no slip for bicycles or skidding of automobiles on this pavement."

Free Dinners for Employees

THE National Electric Company, successor to the Christensen Engineering Company, of Milwaukee, has inaugurated a new department which is nothing less than a free dining room for its officers and employees of the executive and engineering departments. Two pleasant dining rooms, a butler's pantry, and a kitchen have been fitted up on the second floor of the new office building. One dining room is for the officers and their guests and it is expected that the officers will get in closer touch with each other by this dining together. The second dining room is for the employees. No charge is to be made for the dinners, but the company hopes to be more than repaid in the increased interest the employees will take in their work and in the time that will be saved. Formerly an hour and a half was given for the noonday meal, but the time will now be cut down to forty-five minutes.

Signalphone Police and Fire Alarm

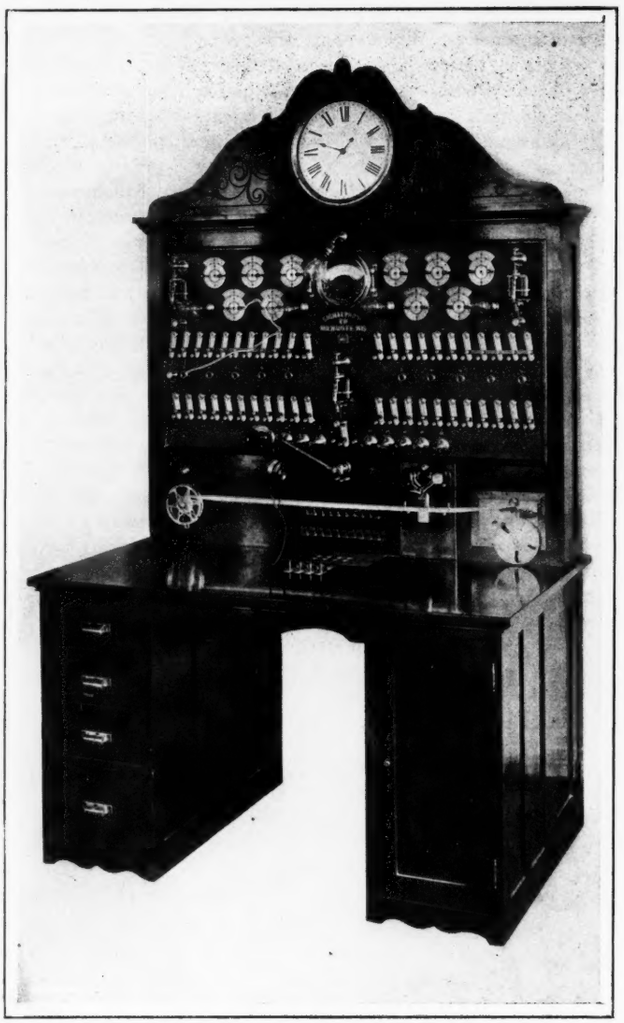
BOX CLOSED

THE need of a perfect fire alarm system in every municipality requires now no argument—the necessity has been demonstrated many times. No less in importance to a city or town is the equipping of its police department with a signal system such that the officers will, at all times, be able to communicate quickly with headquarters and by means of which they can be reached by the central office in case of necessity. In municipalities where the police and fire forces are small and insufficient, the need of a good signal system is especially apparent, for every means must be taken to increase the efficiency of the men. An officer can quickly summon assistance, while the central office can mass the officers at a point of danger. The officers will be kept up to their duty by being required to call up at certain intervals, when they might be tempted to shirk if not required to keep in touch with headquarters.

So the need of a fire and police alarm system in all municipalities is an established fact. The point to be decided is the system best adapted to the needs and that will properly perform the service required. The Signalphone is the result of years of practical experience which has produced an absolutely non-interfering system. One instrument does duty for both police and fire alarm service as well as if two separate systems were installed. Thus a large saving is effected at the outset, while the cost of this system itself is moderate.

The simplicity of the system is one of its strong points. Pull down the lever on the box, and the fire alarm is rung; the policeman inserts his key in the box cover and then has but to remove the telephone receiver to be in communication with headquarters. Signals giving the box number are repeated four times and nothing can be done to interrupt or confuse them, nor can the box be pulled again until the four rounds are completed; thus the system is absolutely non-interfering. At the central office the signals are automatically recorded on the register paper with the exact hour and date of transmission. There can be no tamptering with these records by anyone without the fact being known. The time stamps supplied are either automatic or manual, but the company recommends the manual stamp, because it serves as a check on the desk sergeant, because it is simpler, and because it requires no extra battery to run it.

BOX OPEN, SHOWING TELEPHONE


SIGNALPHONE SWITCHBOARD

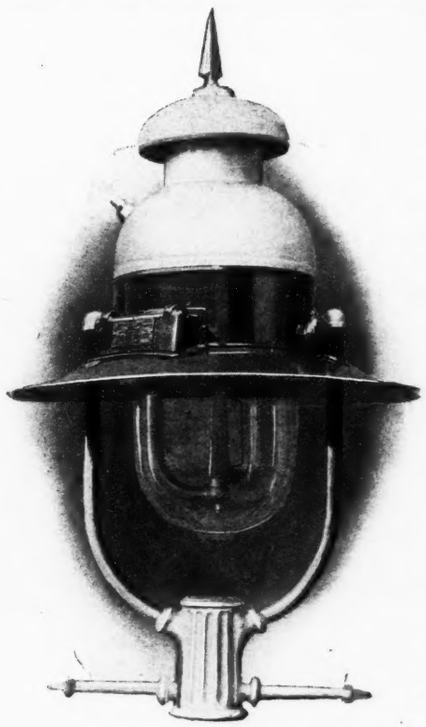
The Signalphone Company, of Milwaukee, Wis., has furnished for the St. Louis Exposition a complete police patrol system of 100 finely made combined signal and telephone boxes with equipment for five precinct headquarters. Santa Clara, Cal., has just been equipped with the Signalphone, and Wellsville, O., is having it installed, while Alliance and Springfield, O., with other cities and towns, are enjoying the protection afforded by this system.

This company also furnishes complete power and circuit storage battery switchboard equipment for fire and police alarm systems. The above mentioned cities have all been supplied with these storage battery boards.

—The Model City Street at the St. Louis Exposition will be one of the most interesting spots at the Fair for all interested in city government. Model city buildings, street pavings, etc., will be shown. Space has been allotted to the N. O. Nelson Manufacturing Company, St. Louis, Mo., in which to install a septic sewage disposal system, which will be a working exhibit, purifying the sewage from one of the buildings. The Nelson Company will also have a small office building where will be diagrams of the system it is installing. A postal card will bring the latest booklet of the Company, giving a full description of its system.

New Automatic Incandescent Lamp

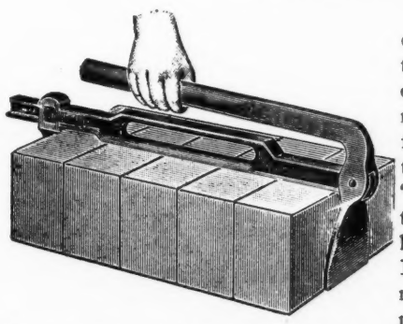
ONE of the latest and most successful candidates for street lighting is the new lamp of the Automatic Incandescent Light Company, illustrated herewith.



We are informed that this light has stood the test of summer and winter without a single failure. It is claimed for this lamp that it will produce a high candlepower light at a cost of less than one cent an hour; that it is brilliant, steady and more diffusive than any other reliable light; and that it competes successfully with even the electric arc light.

Each lamp is complete within itself, therefore no plant of any kind is required, and likewise no piping or wiring. Lamps are supplied for erecting on posts or to suspend from brackets. They are automatically controlled and as easily lighted, and require no more care than the ordinary gas lamp. They are absolutely safe even in unskilled hands. The automatic lamp is designed exclusively for outdoor service and for lighting streets, highways, parks, railway stations, etc. We predict a very large demand for this light, several towns having lately voted to adopt it. It is manufactured by the Automatic Incandescent Light Company, Northboro, Mass.

Pierce Labor-Saving Device



THE successful contractor is the one who adopts the most up-to-date methods in his work that every moment may be saved, for in these times with the high price of labor, "time is money." One of the greatest time savers in handling brick is the Pierce Brick Handler, made by the Pierce Supply Co., of Cleveland. When bricks are delivered in trucks, they are usually packed in uniformly. The unloader, equipped with this device, quickly slips it over a row of bricks and lifts them out instead of taking up brick by brick. Thus 50 per cent. of the labor is saved. In moving the bricks from the piles at the side of the street to the man who is laying them, another large percentage of time is saved, while all the chipping that occurs when a wheelbarrow is used for this purpose is prevented. It is easier for the workmen, as their hands are not cut as when each brick must be taken up by hand. All these points and more unite in saving the cost of these devices in a short time.

This company also has a full line of castings for street improvement of new and improved design. Full particulars with prices may be obtained by addressing the company at the American Trust Building, Cleveland, O.

A New Idea in Street Lighting

THE accompanying illustration gives a somewhat inadequate idea of the principle involved in the new system for street lighting for large and small municipalities which is exclusively manufactured by the Royal Gas Light Company, of Chicago. This is a new idea in street lighting and should appeal to many towns, especially where there are no gas mains in the streets.

The light is supplied from a tank and generator concealed in the base of the iron post. It is said on good authority that this light requires less attention than the electric light and has not the disadvantage of being dependent upon one source of energy to keep it in operation. There is no engine or dynamo to break down and there are no costly repairs. The cost of installation is but a fraction of that required for electricity or gas, and the lamp is simple and durable. These lights do not require a large force of employees to look after them and the actual running expense is light.

Municipal officials will be interested in this type of lamp, and especially those officials in small towns, the streets of which have been "illuminated" by small smoky kerosene lamps at long intervals that serve but to render the gloom even more intense.

The Company will be glad to reply to inquiries from officials of cities, towns, or villages. A guaranty is given that this system will work in all kinds of weather. Fuller particulars may be obtained by addressing the Company at 210 Kinzie street, Chicago, Ill.

Will Auto Trucks Supplant Horses?

IN a recent issue of the *Scientific American* appeared an interesting article on the horse *vs.* the auto truck, by Oscar Shadbolt, a well-known truck builder of New York, whose long experience in this line entitles him to the most respectful attention. He called attention to the fact that in the discussion of the horseless truck, the truck builder has taken little, if any part, and the subject is one which requires the attention of the practical truck builder, to judge from the freaks in the way of auto trucks that are being placed on the market. The modern horse truck is the development of many years, and the same study must be given the auto as was devoted to the horse-drawn vehicle. While the bicycle was the forerunner of the auto, and the auto truck cannot be built on these lines; "success is absolutely and forever impossible on the lines of bicycle construction, however the vehicle may be magnified in size, or whatever devices may be adopted to mask its natural limitations."

Natural laws and requirements, in the opinion of the author, require that these essentials be met:

"First, the motive power must be so applied that its operation shall not call for a skill which in another field would command a high salary.

"Second, rubber tires are an insuperable obstacle, at present cost.

"Third, wheels must dish, and the use of a dished wheel precludes the use of a revolving axle. This is a vital fact and a fact self-evident to any practical truck builder. Too much stress cannot be laid on this feature.

"Fourth, machinery must be accessible.

"Fifth, weight of vehicle must be within some reasonable proportion to freight load.

"Sixth, while the heavy merchandise motor truck will ordinarily move slowly, its weight and momentum will necessitate brakes of quick, sure and powerful action.

"Seventh, the vehicle must not be a freak construction, but reasonably conform to styles which shall best serve business conditions and wants, substantially as does the horse-drawn truck.

"Eighth, it is very desirable, if not essential, that the truck shall turn within its own length.

"Ninth, the pivotal point on which the decision for or against the

motor truck must turn is dollars; in one way or another, it must show the dollars earned or the dollars saved."

An immense advantage the motor truck has over that horse-drawn is that the weight of the former is limited only by the strength of roadway and the distance covered by the speed ordinances. At least twice the distance covered by the horse truck is assured for the auto.

Items of Interest to the Trade

—Mr. J. M. Hardy, who is widely known in the trade, will be connected with the Eureka Fire Hose Company after May 1st with full charge of their fire hose business in the New England States.

—Mr. Louis C. Kelsey, former city engineer of Salt Lake City, Utah, has opened an office in the D. F. Walker Building of that city with Mr. C. E. Reed for the practice of civil engineering and general contracting. The firm name is Louis C. Kelsey & Company.

—The Ingersoll-Sargeant Drill Company, New York, has met a serious loss in the death of its president, Hon. William R. Grace, ex-mayor of New York City. Mr. Grace has been succeeded by Mr. William L. Saunders, who had been vice-president since 1897.

—The Miracle Pressed Stone Company, of Minneapolis, has just completed installing one of its power plants for the Pittsburg Concrete Company, at 1201 Grant avenue, Alleghany, Pa., and is now building a similar plant for the Pressed Stone Mfg. Co., at St. Paul, Minn.

—The Hydraulic-Press Brick Company, of St. Louis, Mo., has issued a neatly engraved invitation to its friends to make its offices in the Missouri Trust Building their headquarters while visiting the Exposition. The use of telephones and stenographers will be provided and arrangements made to care for mail.

—The Acme Road Machinery Company, Frankfort, N. Y., advises us that orders have been received this season for crushing plants from seven towns and cities in New York, Pennsylvania, and Connecticut, and for road graders from eight townships in New York, Vermont, and Texas. A large number of orders for dumping wagons have also been received from contractors and municipalities.

—One of the most valuable little handbooks that has come to hand is one recently issued by the Fabric Fire Hose Company of New York. Besides demonstrating the superiority of this make of hose, the book contains a short treatise on "First Aid to the Injured," compiled from reliable sources, and a series of hydraulic tables from an equally reliable author. The tables include one on the capacity of cisterns and tanks according to their diameter and depth; the work done by fire streams and the power required for them, using one, one and a quarter, and one and three-eighths-inch smooth nozzles; friction loss in iron pipes for each 100 feet according to the discharge; the pressure of water according to the head; and the friction loss in hose of two and one-half-inch bore.

—On Friday, April 15, at the request of the College of Engineering, Col. W. F. Morse, Sanitary Engineer, of New York, delivered an address at Cornell University to the faculty and the students of the Engineering Section on the subject of the "Utilization and Disposal of Municipal Waste." The history of English refuse destructors from their inception twenty-five years ago down to the present time was illustrated by many examples. The first American crematory and successive crematories of various types were described, and a concise account of the various reduction processes included; methods for the utilization of municipal and trade wastes explained, and the production of steam power and the many ways of employing it described.

—A full description with illustrations of a modern and very complete line of road building machinery is given in the 1904 catalogue issued by the Climax Road Machine Company, of Marathon, N. Y. Stone and ore crushers, stationary or portable, elevators and screens and storage bins mounted on wheels, steam rock drills, sprinklers, tank wagons, street sweepers, and vitrified sewer, cast-iron, and riveted steel pipe are among the products manufactured by this concern. Automatic distributing wagons and portable and traction engines are supplied by the company, and one of the leading departments of its business is devoted to the design, manufacture and erection of bridge and steel structural work for bridges, etc. Reversible horse rollers, reversible road machines which may be fitted with runners for use in scraping snow, drag and wheel scrapers, and plows are also manufactured.

—The extensive improvements contemplated by the Phœnix Cement Company, Nazareth, Pa., have all been laid out by Dodge & Day, modernizing and contracting engineers, Nicetown, Philadelphia, Pa., and it is thought the work will be started in the near future. Most of the buildings will be enlarged; electric transmission used throughout, and the entire plant thoroughly modernized in order to materially increase the output to keep pace with the growing demand for its product. This will necessitate the installation of a considerable additional power equipment, as well as a 200 kilowatt generator, tandem compound engine for generator, one fifty and one seventy-five horse power motor, and a number of smaller motors; charging cars, turntable, coal and ashes conveyor, underfeed stokers, steam locomotive for hauling cars to and from the quarries; electric hoist, electric air compressor, blower and exhauster, air-cooling conveyor, belt conveyors, elevators, automatic weighing machine, extension of track system, etc.

Publications Received

—Illustrations of the plant and quarries of the Southern States Portland Cement Company, Atlanta, Ga., are given in its fine catalogue.

—The Lake Shore & Michigan Southern Railroad has issued a little booklet called "Time Clipping," showing how the fast trains of this road are annihilating space.

—The 1904 catalogue of the Wirt & Knox Manufacturing Company, 22-24 No. Fourth street, Philadelphia, Pa., tells all about the Wirt patent hose carts, reels and racks.

—"Lehigh" Portland cement, manufactured by the Lehigh Portland Cement Company, Allentown, Pa., is described in the recent sixty-eight-page catalogue of that Company.

—"Passing of the Ticket Scalper" is the title of a folder recently put out by the New York Central, citing cases where ticket scalpers have been tried and sentenced to prison as told in newspaper clippings.

—The Cement Machinery Company, Jackson, Mich., has issued a catalogue descriptive of its cement-concrete building block machine, known as the Normandin, which will make concrete blocks at the rate of one a minute.

—The legend of Medusa and beautiful illustrations showing some of the places where the Medusa brand of Portland cement has been used, appears in the catalogue of the Sandusky Portland Cement Company, Cleveland, O.

—Catalogue No. 50 of The Contractor's Tool Company, Philadelphia, Pa., describes its line of asphalt rollers, concrete mixers, portable melting kettles, improved fire wagons, asphalt surface heaters, and general equipment for asphalt and other work.

—A souvenir on the history, development and future of Portland cement has been gotten out by the Peninsular Portland Cement Company, of Jackson, Mich. This takes up the uses to which Portland cement can be put and describes the plant and product of this Company.

—The 108-page prospectus issued by the Western States Portland Cement Company, of Jackson, Mich., and Independence, Kan., takes up the nature of Portland cement, the modern process of its manufacture, and the varied uses to which it is being adapted. A description of the Company's plant and the material it puts out are also included.

—The Roebling Construction Company, New York, has issued an exceptionally fine illustrated book of sixty-two pages, showing the ruins of the Baltimore and the Iroquois Theatre fires and the effects of the fire on the various materials employed in the fireproof buildings. Safeguards and recommendations relating to the construction, equipment and management of theatres in general are appended.

CONTRACT NEWS FOR THE MONTH

Including Paving, Sewerage, Water Supply, Lighting, Public Buildings, Sewage and Garbage Disposal, Fire Supplies, Contracts Awarded

N. B.—All news of proposed work sent us by city officials is incorporated in our Weekly Advance News Service and appears subsequently in this "Contract News for the Month" if the date of the reception of bids be sufficiently late to warrant placing the item here.

City officials and others are urged to send us all news of contemplated improvements for use in our Weekly Bulletins which are mailed to those interested.

PAVING, PAVING MATERIALS AND MACHINERY

Akron, O.—It is reported that $275,000 will be spent on streets and sewers this year.

Albany, N. Y.—A bill passed the Senate for an appropriation of $1,500,000 for good roads.

Allentown, Pa.—Bids were to have been asked for asphalt or other pavement on Chew street. City Engineer H. F. Bascom.

Altoona, Pa.—Bids were to have been asked for brick paving the last of April. City Engineer Harvey Linton.

Arcadia, Fla.—$5,000 bonds for street improvements will be issued. The Mayor.

Ashland, O.—Plans ready for about 20,000 sq. ft. of brick, cement or flagstone walks.

Athol, Mass.—Voted to issue $2,000 for road improvements.

Atlantic, Ia.—The Iowa Engr. Co., of Clinton, wrote that it is establishing a system of street grades and that considerable amount of cement and brick walls will be laid.

Auburn, N. Y.—The paving of E. Genesee street with asphalt has been under consideration.

Augusta, Me.—Estimates have been prepared for the paving of Depot Square.

Baltimore, Md.—Ordinances provided for the widening of seven streets in the burnt district, the opening of Hanover street, and the extension of two streets. Reported that a bill has passed the House for $6,000,000 appropriation for paving.

Beaver, Pa.—Bids, May 2, for 12,243 feet of road in Hopwell township. State Highway Department, Harrisburg.

Binghamton, N. Y.—Estimates have been prepared for brick pavements on three streets.

Boston, Mass.—Estimated cost of paving Eastern avenue was placed at $11,340.

Brooklyn, N. Y.—$1,250,000 appropriation has been made for paving and repairing streets. Borough President M. W. Littleton.

Canastota, N. Y.—Considering the paving of E. Centre street.

Canton, O.—Plans have been prepared for the paving of E. Fourth street.

Celina, O.—Logan street may be paved as well as three other streets.

Centralia, Ill.—New paving work has been under contemplation. Mayor N. N. Rexford.

Champaign, Ill.—An ordinance provided for 6,600 sq. yds. of paving on Elm street and 22,000 sq. yds. on Randolph street.

Chattanooga Tenn.—Poplar street is to be graded, drained, and paved for eleven blocks.

Cincinnati, O.—Five streets are to be paved and Bossett road, Pine Hill, may be paved at a cost of $70,000.

Cleveland, O.—City Auditor J. P. Madigan wrote that $212,000 street improvement bonds were to be sold on April 25th.

Columbus, O.—Noble street is to be graded and paved.

Dallas, Tex.—Dallas County has been considering good roads plans.

Danbury, Conn.—It was stated that a stone crusher would probably be purchased. Patrick Durkin, Superintendent Public Works.

Delray, Mich.—A resolution provided for the paving of River street.

Detroit, Mich.—Will spend $21,851 on cedar block, $242,451 on brick paving and repairing, and $136,220 on asphalt paving.

Elyria, O.—Middle avenue will be graded, paved and curbed.

Fall River, Mass.—A bond issue for $35,000 has been authorized for curbing, one of $35,000 for paving, and one of $30,000 for walks.

Findlay, O.—It is said that W. Sandusky street will be paved.

Geneva, Ind.—Bids, May 3, for paving various streets with brick or block. Clerk, Board of Public Works.

Glenville, O.—St. Clair street will be asphalted and three other streets paved with brick.

Greenfield, Mass.—Several streets are to be macadamized.

Guthrie, O. T.—A report stated that a road scraper was to be purchased. City Engineer W. S. Gamble.

Hamilton, O.—An ordinance provided for the paving of Buckeye street and for cement walks on Hanover. City Clerk Homer Gard.

Indianapolis, Ind.—$25,000 have been appropriated for street repairs and improvements.

Jacksonville, Ill.—Ordinances provided for paving of six streets, or about 63,786 sq. yds.

Jamaica, N. Y.—Considering the construction of two boulevards to connect with Rockaway.

Jefferson Barracks, Mo.—Plans have been prepared for road work and extensions at this post.

Kalamazoo, Mich.—Resolution provided for the paving of South street.

Lenox, Mass.—A State road to Pittsfield will be built at a cost of $20,000.

Lexington, Ky.—Several streets will be paved with creosote wood block.

Little Falls, N. Y.—Voted to issue $40,000 bonds for street improvements. City Clerk Hazlett.

Lowville, N. Y.—It is said that $40,000 bonds have been voted for paving.

Malone, N. Y.—It is said that it was voted to buy a stone crusher.

Manistee, Mich.—City Engineer G. B. Pike wrote that bids were wanted May 3d for 4,300 feet of combined cement curb and gutter.

Mansfield, O.—Estimated cost of paving with brick or block and cement walks on Sherman avenue is $15,000; with asphalt, $20,000. Ordinances provided for improvements to Spring and Brown streets.

Masillon, O.—An ordinance provided for $50,000 bond issue for paving. It is said that it was decided to pave all streets with fire brick. City Engineer.

Milford, Mass.—It was voted to buy a steam road roller. Town Clerk McLaughlin.

Minneapolis, Minn.—Resolutions provided for the paving of various streets.

New Orleans, La.—May have a municipal asphalt repair plant.

Norwich, N. Y.—Bids, May 2, for $3,000 bonds issue for macadamizing Plymouth street. Village Treasurer.

Nyack, N. Y.—Main street will be paved at a cost of $6,000.

Oakland, Cal.—The Council has ordered considerable street work.

Paoli, Ind.—Bids, May 4, for 26,184 feet of road building. County Auditor G. W. Tegarden.

Perth Amboy, N. J.—Will probably issue $50,000 bonds for macadam paving.

Pittsburg, Pa.—Council Committee of Public Works recommended $250,000 street improvements.

Plainfield, O.—Will pave the main street with brick.

Plymouth, Mass.—Have appropriated $18,000 for macadamizing Sandwich street.

Rochester, N. Y.—Bids were to have been asked for grading and paving of Market street. City Engineer E. A. Fisher.

Saginaw, Mich.—Resolutions were passed for the paving of five

streets. $20,000 appropriation recommended for repairs to streets and walks. City Clerk Barton.

Salisbury, Md.—Will probably issue bonds for street improvements.

San Francisco, Cal.—Estimated cost of repairing two streets placed at $10,475.

Scranton, Pa.—Ordinances provided for the opening, paving, curbing, etc., of several streets. City Clerk Lavelle.

Shelbyville, Ill.—Bids, May 2, for brick paving, curbing, etc. Board of Local Improvement.

Shreveport, La.—Bonds issued for 25,879 sq. yds. of paving. City Engineer Woodward.

South Bend, Ind.—Four streets will be graded and curbed and cement walks laid.

Southington, Conn.—About May 1 will let contract for a mile of macadam road. Town Clerk Lewis.

Tacoma, Wash.—Yakima avenue may be asphalted. City Engineer Nicholson.

Trenton, N. J.—Legislature passed a bill appropriating $250,000 for good roads. Montgomery street will be widened.

Trumansburg, N. Y.—Voted to issue $15,000 bonds for street paving. City Clerk Osborn.

Utica, N. Y.—Plans prepared for paving various streets with asphalt.

Valdosta, Ga.—Will probably spend $50,000 for brick paving.

Vicksburg, Miss.—Bids for paving were to have been asked.

Westfield, Mass.—Voted $25,000 for highways and bridges. Town Engineer.

Wilmington, N. C.—Bids were to have been asked for brick paving to cost $20,000. S. P. Adams, City Engineer.

Worcester, Mass.—Chandler street will be paved with granite block.

Xenia, O.—Detroit street will be paved with brick on concrete; 4,237 sq. yds. J. E. Jones, Clerk Board of Public Service.

CONTRACTS AWARDED

—After a trial of the bitulithic pavement last year, Birmingham, Ala., has awarded an additional contract this year. Among the other cities that have taken similar action are: Pawtucket, R. I., the first city to adopt this pavement, has made appropriations for 28,000 square yards; Shreveport, La., has awarded contract to Nashville Roofing and Paving Co. for 86,000 square yards; New Bedford, Mass., appropriated $20,000 for bitulithic this year, the largest yearly amount ever spent in this city for paving; Portland, Me., has awarded a contract to Warren Brothers Company for bitulithic paving; Portland, Ore., has ordered $150,000 worth of bitulithic after investigating this pavement at Tacoma.

Atlantic City, N. J.—City Construction Co. has contract for paving various streets at $11,690.

Augusta, Ga.—W. F. Bowe has contract for 30,000 lin. ft. of granite curb at 33½ cents.

Baltimore, Md.—John L. Robertson has contracts for paving McComas street with asphalt block at $2.39; Ducatelle street with same at $2.35; Payson street with same at $2.30.

Bay City, Mich.—Contract let W. J. Meagher for brick on Washington street at $32,638.

Beacon Falls, Conn.—Frank Brazos, New Haven, has contract for grading and graveling at $7,200.

Boston, Mass.—R. F. Hudson has contract for 10,000 feet of State road at $11,211.

Center Line, Mich.—J. S. Germain & Son have contract for six miles of macadam road at $35,794.

Cincinnati, O.—H. J. Henkel & Co. have contract for paving two streets at $12,981.

Clarinda, Ia.—Contract let Dunnegan & Corey for 27,000 sq. yds. of brick paving on five-inch concrete at $1.98 and for 7,700 ft. concrete curb at 36 cents.

Cleveland, O.—Spence Bros. have contract for Telford macadam on Lake avenue at $50,000.

Cortland, N. Y.—R. W. Hensen has contract for paving Port Washington street at $21,427.

Dayton, O.—Kelly-Springfield Road Roller Co. has contract for a 12-ton roller.

Des Moines, Ia.—Barber Asphalt Paving Co. has contract for 32,400 sq. yds. at $2.

E. St. Louis, Ill.—M. J. Kelly has contract for 8,000 ft. of artificial stone combined curb and gutter at 94 cents and 15,000 sq. yds. brick paving on 6-inch concrete at $1.45.

Georgetown, Del.—Contract awarded Christiana Const. Co. for 3,630 ft. of 12-foot macadam road at $5,439.

Grafton, N. D.—P. McDonnell, Duluth, has contract for 1½ miles of cedar block paving at about $60,000.

Harrisburg, Pa.—Warner-Quinlan Co. was low bidder for asphalt on 15th street. Barber Asphalt Paving Co. has contract for asphalt on ten streets for from $1.88 to $1.99 sq. yd., and granite curb at from $1.05 to $1.19 lin. ft.

Hartford City, Ind.—Nolan & Slattery, Crawfordsville, have contract for paving three streets with brick.

Hutchinson, Kan.—T. E. Burton, Wichita, has contract for brick paving at $1.36 sq. yd.

Jasper, Tenn.—Home Constr. Co. has contract for grading 100 miles of roads and macadamizing 95 miles at about $150,000.

Jefferson City, Mo.—Pope & Droste have contract for 21,302 sq. yds. brick paving at $1.82 and curb at 65 cents lin. ft.

Lynchburg, Va.—J. R. Ford has contract for paving three streets.

Marion, Ind.—It is stated that Modlin & Overman have contract for gravel road at $6,295.

Meriden, Conn.—Thos. Kearney has contract for road at $6,307.

Milwaukee, Wis.—R. J. Hickey has contract for brick paving on Clinton street at $2.13½ sq. yd.

New Orleans, La.—Louisiana Improv. Co. received contract for paving on South Rampan street.

New York, N. Y.—John Twiname has contract for a highway at $8,937. W. F. Murray was low bidder for grading on Southern Boulevard at $71,470.

Portsmouth, O.—J. A. Kelley & Bro. received contract for paving brick on North William street at $1.16½, and 46 cents. lin. ft. for Berea stone curb. Jardine, Brewer & Tomlinson, Chillicothe, received contract for brick on Fourth street at $1.10, and cement curb and gutter at 50 cents per ft.

Princeton, Ind.—Contract let Chas. White & Co., Booneville, for road in Potoka Township at $64,000.

Roseville, O.—Contract let Roseville Brick & Terra Cotta Co. for paving Main street.

St. Charles, Mo.—Contract let Dierker Transfer Co. for 17,600 cu. yds. of grading at 40 and 50 cents. Frank Bottani has contract for brick paving at $1.70.

St. Joseph, Mo.—Ratcliffe & Gibson have contract for brick on five streets at $1.49⅞. Phœnix Brick & Constr. Co. received contract for brick at $1.28.

St. Louis, Mo.—M. Sullivan & Son have contract for brick paving, curb, etc., at $16,592.

St. Paul, Minn.—Contract awarded J. M. Thornton for grading Capitol Boulevard at $4,067.

Scranton, Pa.—Barber Asphalt Co. has contract for asphalt at $2.23 sq. yd. Maryland Constr. Co. has contract for a road.

Seattle, Wash.—E. A. McGrath has contract for concrete walks at $5,291.

Shreveport, La.—After a tour of inspection on the part of the Mayor and other officials, the Council awarded the Nashville Roofing & Paving Co. the contract for 47,000 sq. yds. of bitulithic pavement.

Sullivan, Ind.—Curry & Wood has contract for three miles of macadam road; E. S. Crowder one for six miles; and C. H. Ridgeway one for three miles.

Tampa, Fla.—Jas. Cribbetts has contract for 2½ miles of road.

Titusville, Pa.—E. A. Edwards was low bidder for paving Spruce street at $32,409 with brick.

Toledo, O.—Jas. Horan & Co. have contract for 100,000 sq. ft. artificial stone walks at 12 cts. lin. ft. Garrigan Bros. have contract for Harris pavers on broken stone at $17,356; and Leith Bros. a contract for Union pavers at $5,714.

Versailles, Ind.—Chas. Calvert, Scottsburg, has contract for 22 miles of road at $42,720; Abraham Donaldson, Bloomington, for 13 miles at $26,985.

Warren, Mich.—G. S. Germain & Son have contract for six miles of stone road at $35,794.

Washington, Ind.—Hart & Anderson have contract for Elmore gravel road at $19,000.

LIGHTING

Alpena, Mich.—Alpena Gas Light Co. contemplate extensive improvements.

Atwater, Minn.—Considering light plant and water-works.

Ballard, Wash.—H. A. Srarkey has franchise for electric light plant to cost probably $60,000.

Bay City, Mich.—Committee appointed to ascertain cost of light plant.

Bicknell, Ind.—Reported that H. H. Barr & Co. have franchise for electric light and power plant.

Burgaw, N. C.—May have electric light plant.

Bryan, Tex.—Reported that H. B. Dorsey has franchise for electric light plant.

Canton, N. Y.—Canton Electric Light & Power Co. has franchise for lighting village.

Castle Rock, Wash.—Will sell city light plant with 30-yr. franchise.

Central City, Ky.—Contemplates electric light plant. C. H. Blandford, City Clerk.

Collins, Ia.—May have gas plant.

Columbus, Neb.—May ask bids for electric plant at water-works station.

Delhi, N. Y.—Considering $20,000 bond issue for municipal light plant.

Doniphon, Mo.—Has granted franchise for electric light plant. D. C. Cunningham, Mayor.

Dover, Del.—Will probably make improvements to light and water plants to cost about $8,500.

Duluth, Minn.—Will have municipal electric light plant.

Farmington, Mo.—Contemplates electric light plant. Geo. M. Wilson, Mayor.

Fitchburg, Mass.—Fitchburg Gas & Electric Light Co. will erect new gas holder.

Fond du Lac, Wis.—Citizens' Light, Heat & Power Co. has franchise; will erect new electric light and power plant.

Fremont, N. C.—Considering electric light plant.

Fullerton, Cal.—Will probably sell franchise for electric light and power purposes.

Gilbertville, Mass.—Considering electric lighting.

Glenwood Springs, Colo.—Considering $80,000 bond issue for light plant and water-works.

Greenfield, Mass.—Considering electric plant.

Greenboro, Ga.—Franchise for electric light plant granted T. B. Rice, of Greensboro, and R. L. West, of Atlanta.

Greenwood, Miss.—Considering purchase of plant of Greenwood Light & Water Co. The Mayor.

Hamilton, O.—May issue $5,000 bonds for improving lighting system.

Hancock, Mich.—Herbert L. Baer has franchise for gas plant.

Hartford, Conn.—Will ask new bids probably for street lighting.

Hattiesbury, Miss.—Will issue $60,000 bonds for electric light plant. The Mayor.

Hazlehurst, Ga.—Will probably have light plant and water-works.

Homer, La.—City contemplating electric light plant. The Mayor.

Jackson, Ala.—May have electric light plant.

Kenmare, N. D.—F. W. Amsler & A. B. Kerlin have franchise for electric light plant.

Laurel, Miss.—Contemplating $5,000 electric light plant. The Mayor.

Lawrenceburg, Tenn.—Considering electric light plant. The Mayor.

Little Rock, Ark.—Pulaski Gas Light Co. contemplates 150,000 cu. ft. gas holder, 10 in. main and other improvements. R. I. Speer, Mgr.

Lincoln, Neb.—Voted to issue bonds for electric light plant. Thos. H. Pratt, City Clerk.

Logan, Utah.—Voted to issue $12,000 bonds for completing light plant.

Martinsville, Va.—May have electric lighting plant.

Mason City, Ia.—Will probably build light plant.

Merrimac, Mass.—Plans preparing for electric light plant.

Millhall, Pa.—May have electric light plant.

Milwaukee, Wis.—Voted to issue $500,000 bonds for electric light plant.

Montreal, Can.—May have city gas plant.

Mooresville, N. C.—Considering electric lights.

Ottawa, Ill.—Will, according to estimate, cost $8,000 to install electric light plant.

Osyka, Miss.—Voted to issue $15,000 bonds for electric light plant and water-works. Town Clerk.

Pickneyville, Ill.—Bids, May 2, for electric light plant. Peter J. C. Hamm, City Clerk.

Plaineview, Tex.—State Normal School will install electric lighting power plant. Prof. Brown, College Station.

Richmond, Va.—Estimated cost of electric light plant is $150,000. C. E. Bolling, Superintendent Water-Works. Will have new gas holder to cost $150,000.

Ridgefarm, Ill.—New company reported formed to construct light plant. Wm. Henderson.

Rulo, Neb.—Will probably issue light and water bonds.

Rusk, Tex.—May have electric plant.

St. Mary, O.—Light and water plants will probably be improved. H. W. Stearns, Clerk. Board Public Service.

Shawnee, Okla, Ter.—Shawnee Gas Co. incorporated, capital $100,000 for building gas plant. J. C. Fisher.

Spring Green, Wis.—May have electric light plant.

Sundance, Wyo.—Reported that Economic Pow. Co. will build $900,000 plant to supply light and power.

Sykesville, Md.—Will vote in May for light plant and water works.

Upper Alton, Ill.—Considering lighting plant.

Uvalde, Tex.—Reported that this place will have electric light plant.

Versailles, Mo.—Plans preparing for power plant at light plant.

Washington, N. J.—Chas. B. Hindle has asked franchise for water, gas and electric light plant.

Watkins, N. Y.—Voted to issue $20,000 bonds for light plant.

Waveland, Ind.—Johnson Acetylene Gas Co. has 25-year franchise for commercial lighting system.

Westfield, Mass.—Have appropriated $10,500 for municipal power plant.

Westminster, S. C.—May have water power electric light plant.

West Point, Va.—May have electric light plant.

Wickliffe, Ky.—Bids, May 2, for 1 60-K. W. alternator, 60-cycle single-phase engine type generator, also arc lamps and other appliances. G. P. Prentis, Ch. Lt. Com.

Wildwood, N. J.—Seacoast Gas Co. organized, will erect gas plant.

Wise, Va.—May have electric light plant and water works.

Woodbury, Conn.—Probable cost of reservoir and electric light plant is $15,000.

Woodville, Miss.—Will probably have electric light plant soon. The Mayor.

Contracts Awarded

Berkeley, Cal.—Berkeley Electric Co. has 2-year lighting contract at $6 per lamp for 160 lamps.

Columbus, Ga.—Reported that proposition of C. R. R. Co. to furnish street lighting for 1905 at $60 per arc light per year has been accepted.

Huntsville, Ala.——Huntsville Ry. L. & Power Co. has five-year contract for lighting streets.

Jonesboro, N. C.—Have let contract for electric light plant. The Mayor.

Lewistown, Pa.—Lewistown Elec. Lt. Co. has contract for arc instead of incandescent light at $65 per light.

Middleport, N. Y.—Albion Elec. Lt. & Power Co. has contract for lighting city at $60 per lamp per year.

Ogden, Ia.—Northwestern Equipment Co. of Minneapolis, has contract for electric light plant at $9,000.

SEWERS

Aberdeen, Miss.—Will spend $100,000 for sewers and water works.

Akron, O.—Will spend $275,000 for streets and sewers this year.

Annadarko, Okla. Ter.—Bids, May 2, for $30,000 sewer bonds. B. E. Beebe, City Clerk.

Angelesea, N. Y.—New sewer system will cost $18,000.

Arcata, Cal.—Voted to issue $35,000 bonds for sewers. J. B. Lilley, City Clerk.

Auburn, N. Y.—Will establish sewer district in 4, 5, and 7th wards, to cost about $80,000.

Bird Island, Minn.—Considering sewer system.

Cape May, N. J.—Reported that $140,000 sewer will be issued.

Caribou, Me.—Voted to construct sewer system.

Central City, Ky.—Will probably do some sewer work this year. C. H. Blandford, City Clerk.

Centralia, Ill.—Contemplate new sewer work. N. N. Rexford, Mayor.

Charleston, S. C.—Sewer system may be improved.

Cincinnati, O.—Reported that C. H. Meeds, has been appointed to make surveys for Mill Creek sewers, to cost about $1,000,000.

Coffeyville, Kan.—Plans preparing for sewer system.

Coldwater, Mich.—Voted to issue $50,000 bonds for sewer system. Wm. G. Moore. City Clerk.

Colusa, Cal.—Were to make surveys for sewer system. F. F. Wriglet, Town Secretary.

Dayton, O.—Will probably sell $24,000 storm water sewer bonds.

Doquoin, Ill.—Have been considering sewers and water works.

Eaton, O.—Will probably consider sewer system soon.

Fall River, Mass.—Will spend $100,000 for sewers.

Granville, O.—Mayor Swartz recommended a sewer system.

Greenwood, Miss.—Were to vote on $125,000 bond issue for sewerage, electric lights, and water works. The Mayor.

Harriman, Tenn.—Plans prepared for 8,000 feet of sewers. F. J. Manley, City Engineer.

Hartford, Conn.—$30,000 reported appropriated for extension to intercepting sewer.

Haverhill, Mass.—Considering sewer work.

Havre de Grace, Md.—Will vote May 2 on $20,000 bond issue for sewerage system. Town Clerk.

Hoboken, N. J.—Probable cost of sewer system to drain meadow district, including 3 miles trunk sewers, will be $300,000.

Hyattsville, Ind.—Voted to issue $30,000 bonds for sewer system. J. F. Hickey, City Clerk.

Indianola, Miss.—Will issue bonds for sewerage system. C. P. Adin, Mayor.

Jackson, Ky.—Contemplate sewer system and water works. A. C. Barrow, City Engineer.

Janesville, Wis.—Plans prepared for four sewer districts.

Jersey City, N. J.—Reported that $150,000 sewer bonds will be issued.

Kensington, Md.—Estimated cost of sewer system is $30,000 to $35,000.

Lancaster, Pa.—$250,000 appropriated for sewers.

Lowell, Mass.—Sewer Com. voted to recommend sewers in nine streets; total estimated cost, $31,299.

Mansfield, O.—Ordinance provides for improvement of 3rd sewer district. D. S. Koontz, Clerk.

Marshall, Mo.—Plans preparing for sewer system to be about three miles in length. F. W. Watson, City Clerk.

Montgomery, Ala.—Will vote May 29, on $350,000 bond issue for sewers, water and schools.

Morris, Minn.—Have been considering sewerage system.

New Castle, Pa.—Plans approved for Atlantic Ave. sewer. R. H. McConaghy, City Engineer.

New York. N. Y.—Will spend $700,000 for relief sewer in Webster Ave., the Bronx, and $150,000 for Johnston Ave. sewer in Brooklyn.

Norton, Va.—Were to vote on issue of $25,000 bonds for sewer system and building. The Mayor.

Oakland, Cal.—Were to vote on issue of about $300,000 for sewer works. City Clerk.

Oshawa, Ont.—Voted to construct sewer and water system. Thos. Morris, Town Clerk.

Peabody, Mass.—Sewerage bill has been passed by legislature for intercepting sewer, also giving this town permission to issue $150,000 bonds for same.

Peoria, Ill.—Considering sewer system for East Bluff District. Estimated cost, $350,000.

St. Bernard, O.—Bids, May 9, for sanitary sewers in various streets. Geo. Meyer, Village Clerk.

Saugerties, N. Y.—Mayor A. Rowe writes that it was voted to raise $86,000 for sewers.

South Bend, Ind.—Bids, May 6, for trunk sewer on South Bend Ave. City Clerk.

Stamford, Conn.—Will purchase material for sewer work to be done by the day. W. H. Arthur, Supt. Public Works.

Contracts Awarded

Augusta, Ga.—J. H. McKenzie & Son have contract for 1,853 feet brick sewer at $1.44 per linear foot for egg shaped, $1.79 for 54-inch circular, and $2.74 for 60-inch circular.

Brainard, Minn.—E. T. Webster, Green Bay, Wis., has contract for sewer at $8,922.

Delray, Mich.—John S. Alleld was low bidder for McGregor Ave. sewer at $22,174.

Dolgeville, N. Y.—Nicolette & Harder, of Potsdam, have contract for sewer system at $33,473.

Eldora, Ia.—M. M. Mulford has contract for sewer at 94½ cents per linear foot.

Fall River, Mass.—Border & Remington have contract for sewer pipe for year.

Ft. Ontario, N. Y.—C. A. Miner of Wilmington, Del., has contract for sewerage and drainage system and for grading at $77,849.

Georgetown, S. C.—Nichols & Co., Chattanooga, Tenn., have contract sewer system.

Hudson, Mass.—Gow & Palmer, Boston, have contract for sewer system at $32,658.

Laurel, Miss.—Iowa Eng. Co. write that they have contract for sewer system, for which $20,000 bonds have been issued.

Longmont, Colo.—Gaffey & O'Keefe have contract for sewers at $60,000.

New Rochelle, N. Y.—Bellew & Merritt, of Tuckahoe, have contract for completing Meadow Lane drain at about $41,000.

New York, N. Y.—Arthur F. M. Guiner has contract for ateration to St. Nicholas Ave. sewer at $29,463.

New York, N. Y.—Cunningham & Kearns Constr. Co. has contract for altering sewer in Broad St. at $78,854.

St. Bernard, O.—Baer & Co. have contract for Mitchell Ave. sewer at $4,800.

St. Paul, Minn.—P. J. Ryan was lowest bidder for sewers in three streets at $10,437.

Springfield, Ill.—Spence Bros. have contract for sewer at $1.10 per linear foot, inlet pipe at 40 cents per foot, and four manholes $25 each.

Washington, D. C.—Camden Iron Works, Philadelphia, Pa., has contract for c. i. pipe at $2,520 and U. S. C. I. Pipe & Fdy. Co. for special castings, at $1,281. Bids, May, 7, for sewage screens and apparatus complete.

WATER SUPPLY

Aberdeen, Miss.—Will spend $100,000 for water works and sewerage.

Atlanta, Ga.—Will probably lay seven miles of mains this year.

Auburn, N. Y.—May make about four or five miles of extensions to mains.

Batavia, N. Y.—Considering new water supply.

Bellaire, O.—Bids about May 1 for $20,000 water bonds.

Bennetsville, S. C.—Contemplate water works. P. A. Hodges, Mayor.

Braintree, Mass.—Duscussing meter system.

Buffalo, N. Y.—Board of Works recommended new mains which will cost about $100,000.

Carlisle, Ky.—Plans will be prepared for water works to cost $25,000.

Carrollton, Ga.—Were to vote, April 30, on $45,000 bond issue for water works.

Charlotte, N. C.—Will spend about $100,000 for water works

improvements, new mains, pumping stations, new dam, etc. A. E. Boardman, Engineer.

Deposit, N. Y.—May vote on question of water works.

Dover, Del.—Will probably make improvements to water and light plants to cost $8,500.

Drayton, N. D.—Considering new water works.

Duquoin, Ill.—Considering water works and sewers.

El Paso, Tex.—International Water Co. will probably spend $750,000 for water works. W. E. Race, Manager.

Emporia, Va.—Were to ask bids for improving water system or sell franchise. J. R. Guffard, Town Clerk.

Enid, Okla. Ter.—Voted to issue $75,000 bonds for water works. The Mayor.

Escanaba, Mich.—Reported that E. Water Works Co. will spend $85,000 for improvements.

Floresville, Tex.—Will construct water works. Bonds not yet sold. J. C. Thompson, City Clerk.

Fredrick, Wis.—May have water works.

Fulton, N. Y.—Bids, May 2, for a $30,000 pumping engine. Board Public Works.

Glendine, Mont.—Contemplate water works and sewers. B. S. Adams, City Engineer.

Gloucester, Mass.—Ordinance provides for $90,000 water loan.

Greenwood, Miss.—Were to vote on $125,000 bond issue for purchase of water works, electric lights, and sewerage. The Mayor.

Guthrie, Okla. Ter.—Were to vote on $100,000 bond issue for water works improvements.

Hazlehurst, Ga.—Will probably have water works and light plant.

Indianola, Miss.—Were to sell bonds for water works.

Jackson, Miss.—Will probably spend a quarter million for water works, it is said.

Lima, O.—$143,337 appropriation recommended for 300,000,000 gallon reservoir and force mains, pumping stations and sinking of wells. John Thomas, Director Public Works.

Lincoln, Neb.—Estimates have been prepared for water works. Geo. L. Campen, City Engineer.

Louisa, Ky.—May have water works.

Lynchburg, Va.—Bids, May 16, for conduit for water supply. Water Commissioner.

McKeesport, Pa.—Cleaning and repairing of mains will cost $10,000. H. T. Verner, Superintendent water works.

Mason, Miss.—Will have water works to cost $25,000.

Madisonville, Ky.—Plans accepted for water works system. Will let franchise publicly on May 2. The Mayor.

Marietta, O.—Bids, May 3, for improving water works. Board Public Service.

Maynard, Mass.—Were to spend $1,500 for water meters.

Medford, Ore.—Voted not to sell water works and light plant.

Minneapolis, Minn.—Committee appointed to consider water purification.

Montgomery, Ala.—Will vote, May 29, on $350,000 bond issue for water, schools and sewers.

New Albany, Ind.—New Albany Water Works Co.'s franchise extended to 1944. Will install filter system in three years.

Newark, N. J.—Considering high pressure water service for fire protection.

Newton, Ia.—Proposed to lay new water mains at cost of $15,000. A. C. Gates, City Clerk.

Oakland, Cal.—Estimated cost of water pipe system as follows: Pipe system, hydrants and meters, $1,634,500; low service pumping station, $21,000; high service pumping station, $59,500; low service reservoir, $128,000; high service reservoir, $20,000; extras, $25,000. F. C. Kurner, City Engineer.

Ogdensburg, N. Y.—May replace cement mains with c. i. pipe for about 12 miles.

Oshawa, Ont.—Voted to construct water works and sewer system. Thos. Morris, Town Clerk.

Osyka, Miss.—Voted to issue $15,000 bonds for water works and high plant.

Port Angeles, Wash.—Water works will cost about $80,000.

Port Townsend, Wash.—Will have water works to cost about $25,000.

Rahway, N. J.—May have filtration plant.

Rochester, N. Y.—Plans preparing for reservoir. E. A. Fisher, City Engineer.

Rumford Falls, Me.—Rumford Falls Light & Water Co. is to put in filter plant and build one million-gallon stand-pipe.

Sayre, Pa.—Surveys begun for water system for this place and Athens.

Schenectady, N. Y.—An ordinance provided for $110,000 water bond issue.

Shenandoah, Va.—Were to vote on $20,000 bond issue for water works. The Mayor.

Slingerland, N. Y.—Suburban Water Co., will probably spend $10,000 for extensions. W. H. Slingerland, Supt.

So. Norwalk, Conn.—Contemplate $30,000 filter. J. E. Taylor, City Clerk.

Staatsburg, N. Y.—May have $18,000 gravity system.

Swampscott, Mass.—Voted in favor of meter system.

Skyesville, Md.—Will vote in May for water works and light plant.

Trenton, N. J.—Will spend $100,000 for extending water main system.

Troy, N. Y.—May spend $300,000 for water works improvements.

Waco, Tex.—Reported that $20,000 will be expended for water works improvements.

Washington, D. C.—Will probably spend $50,000 for extension high service water distribution.

Waterbury, Conn.—Bids, May 3, for laying water mains.

Waterloo, Ia.—Waterloo Water Co. will make repairs and additions.

Waxahachie, Tex.—Voted to issue $25,000 bonds for water system improvements. W. J. Ross, Mayor.

Waxhaw, N. C.—Water works needed. G. H. Burgess, Mayor.

Wheatland, Cal.—Will probably issue bonds for purchase of local water works.

Wilmington, Del.—Plans prepared for new reservoir and filtration system. T. A. Leisen, Ch. Engr.

Wilton, N. H.—A. W. Dudley, of Manchester, is engineer for gravity system of water works.

Winona, Miss.—$100,000 water works bond issue reported voted.

Woodward, Ia.—Voted to construct water works.

Woonsocket, R. I.—May purchase new $45,000 pumping engine.

Contracts Awarded

Anadarko, Okla. Ter.—W. W. Cook & Son, of Junction City, Kan., have contract for water works, at $35,465.

Binghamton, N. Y.—Builders Iron Foundry Co., Providence, R. I., was lowest bidder for twelve million gallon pump at $19,975.

Easton, Pa.—Delaware River Quarry & Construction Co. has contract for about 20,000 feet of 4 to 20-inch mains at $16,723.

Georgetown, S. C.—Guild & Co., Chattanooga, Tenn., have contract for water works and Nichols & Co., of Chattanooga, have contract for sewer system.

Hobart, Okla. Ter.—McQuatters Plumbing Machine Co. has contract for water works, at $142,675.

Kennedy Heights, O.—U. S. Cast Iron Pipe & Foundry Co. bid $4,513 for water pipe, and F. Burns, for laying same, $2,465.

Lawton, Okla. Ter.—McQuatters Plumbing & Machine Co., of Hillsboro, Tex., has contract for water works, $76,983.

Long Island City, L. I., N. Y.—Builders Iron Foundry Co., Providence, R. I., was low bidder for pumping engine at Bayside Pumping Station, at $7,985.

Moscow, Idaho.—Fairbanks, Morse & Co., have contract for pump and engine for $2,590.

Nashville, Tenn.—U. S. C. I. Pipe & Foundry Co. has $10,000 for water pipe.

Peabody, Mass.—Donaldson Iron Co., Emaus, Pa., has contract for 2,000 feet 6-inch pipe at $23.93 per ton, and 3,400 feet 8, 10, 12 and 16-inch, at $23.00 per ton.

Rochester, N. Y.—N. S. C. I. Pipe & Foundry Co. has contract for pipes and supplies for water works at $40,774. Barr & Creelman, for two boilers, at $9,050.

Stowe, N. Y.—Denniston & Co., Rochester, N. Y., have contract for about 2 1/3 miles mains, at $3,831.

Sunbury, Pa.—Pittsburg Filter Co. has contract for filter plant for Sunbury Water Co.; estimated cost, $5,900.

Toledo, O.—Mr. Rabbitt & Sons Co. were only bidders for 1,311 feet 20-inch submerged main at $17,600.

Tupelo, Miss.—G. O. Tenney, of Spartanburg, S. C., has contract for proposed water works at $60,000.

PUBLIC BUILDINGS

Arcadia, Fla.—Voted to issue $12,000 bonds for school. Mayor.

Bath, Me.—Considering $200,000 city hall. E. H. Hyde, Mayor.

Belair, Ind.—$20,000 appropriated for remodeling Hartford county court house. Wm. S. Forward, City Clerk.

Bourne, Mass.—Will have $20,000 school.

Checotah, I. T.—Were to issue $15,000 bonds for school. Mayor.

Cincinnati, O.—Plans accepted for Carnegie Branch Library, to cost about $40,000.

Collinsville, Tex.—Will build $10,000 school. The Mayor.

Gulfport, Miss.—Plans accepted for $20,000 school building.

Houston Heights, Tex.—Plans prepared for $12,000 school.

Matador, Tex.—Motley county has voted $24,500 bonds for court house. County Clerk.

Meriden, Conn.—Voted to build town hall, cost not to exceed $150,000.

Mexico, Tex.—Will erect $20,000 brick school. The Mayor.

Montgomery, Ala.—Will vote, May 29, on $350,000 bond issue for schools, water and sewers.

Newark, N. J.—Have sold $200,000 school bonds.

New Britain, Conn.—Addition to town house will cost $15,000.

Newport, R. I.—Voted on additional $50,000 for high school.

Oakland, Cal.—Were to vote on issue of $650,000 bonds for city hall, and $15,000 for public library.

Oklahoma City, O. T.—Plans accepted for $100,000 court house.

Olivia, Minn.—Plans accepted for jail and sheriff's residence to cost $19,000. H. J. Lee, County Auditor.

Pawnee City, Neb.—Considering court house construction.

Portland, Me.—Plans completed for $20,000 school.

Rockville, Md.—Will probably issue $18,000 bonds for school.

Reisterstown, Md.—Plans preparing for $13,000 addition to high school.

Rushville, Neb.—Voted to build court house. D. F. Van Vleck, County Clerk.

Seneca Falls, N. Y.—Considering plans for $35,000 school.

Sheridan, Wyo.—Will probably have $45,000 court house soon. C. B. Holmes, County Clerk.

Sioux City, Ia.—Plans preparing for school to cost about $25,000. Bids about May 20. W. W. Beach.

Sterling City, Tex.—Sterling Co. will issue $25,000 bonds for court house. County Clerk.

Sycamore, Ill.—Will have $10,000 Carnegie library.

Taunton, Mass.—Will probably have $40,000 school.

Turners Falls, Mass.—Plans preparing for Carnegie Library by McLean & Wright, 110 Tremont St., Boston.

Valdosta, Ga.—Were to vote on bond issue for school.

Contracts Awarded

Antigo, Wis.—Schmidt Bros. have contract for court house at $74,755.

Batesville, Ark.—F. L. Stevenson Construction Co., Dallas, Texas, have contract for P. O. and court house at $56,725.

Boston, Mass.—Morrill Construction Co. has contract for school in Roxbury at $163,945.

Champagne, Ill.—Wm. Weber, of Beaumont, Tex., has contract for Federal court house at $62,689.

Colorado Springs, Colo.—A. J. Gillis has contract for Carnegie Library at $48,600.

Flint, Mich.—Wm. S. Piggins, Detroit, has contract for general construction of Carnegie Library for $22,996.

Houston, Tex.—Ole J. Lotehn has contract for annex to high school at $41,038.

(Continued on page 23.)

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La Grange, Ga.—C. C. Tothero & Co., Birmingham, Ala., have contract for Trough county's court house at $48,000.

Los Angeles, Cal.—Jno. Nelson has contract for school at $21,465

Louisville, Ky.—School Bd. has let contract for two schools, one at $39,505, and one at $33,601.

Mulberry, Ind.—H. C. Seuse has contract for school at $18,314.

Naco, Ariz.—H. C. Prindle, of Bisbee, has contract for court house at about $60,000.

Wahoo, Neb.—Reported that Chas. Olson, Lincoln, has contract for court house at $78,825.

Waterbury, Conn.—J. F. Gaffrey has contract for school at $54,798.

Yazoo City, Miss.—Peter O'Leary, Birmingham, Ala., has contract for school at $32,000.

FIRE SUPPLIES

Auburn, N. Y.—New fire apparatus needed.

Bakersfield, Cal.—$35,000 fire department bonds sold.

Baltimore, Md.—A combination fire wagon may be purchased for Roland Park.

Bangor, Me.—May buy a new truck. Chief Libby. Bids were to have been asked for 2,000 feet of fire hose.

Belleville, Ill.—A paid department may soon be installed.

Burlington, Vt.—Will probably buy a truck. The Mayor recommended a new engine.

Chattanooga, Tenn.—Chief McQuade recommended a truck.

Chicago, Ill.—Nine engine companies and four truck companies may be installed.

Clarksville, Tenn.—New hose recommended, also a combination hose and chemical wagon.

Cranbury, N. J.—May install better fire protection.

Delta, Pa.—Fire apparatus has been contemplated.

Dimondale, Mich.—A fire company has been formed.

Eureka, Cal.—Were to vote on $15,000 bonds for fire apparatus.

Evansville, Ind.—A new fire company may be installed.

Garden Plain, Kan.—May buy a chemical engine.

Grand Rapids, Mich.—A new engine may be purchased.

Harrisburg, Pa.—Superintendent of Fire Alarm C. E. Diehl recommended new alarm boxes. Chief Lutz asked for a combination wagon for the Paxton Company, a third-class steamer, and 10,000 feet of hose.

Holyoke, Mass.—Voted to buy a new truck for the Elmwood district.

Hudson City, N. Y.—May install a new engine company with equipment.

Jackson, Miss.—Will spend $25,000 on a paid department.

Jacksonville, Fla.—A fire-boat may be obtained.

Kalamazoo, Mich.—Chief Raseman recommended a fire station, second-size steamer, an aerial truck and 1,500 feet of hose.

Lebanon, O.—Village fire department formed.

Lexington, Ky.—Mayor Thos. A. Combs writes that he will buy a $2,000 police and fire alarm system.

Milwaukee, Wis.—Chief Meminger asked for a new truck.

Norwood, Pa.—Fire department formed.

Omaha, Neb.—Voted to buy a Metropolitan engine for $5,100.

Orange, Tex.—Have formed a fire company.

Peekskill, N. Y.—Hose wagons and chemical engine called for by press.

Pottsville, Pa.—Will probably rebuild fire alarm system.

Scranton, Pa.—Firemen have been discussing more equipment.

Stoughton, Mass.—A new fire truck recommended by engineers.

Sykesville, Md.—Volunteer company organized. T. M. Anderson, secretary.

Topeka, Kan.—May install a number of fire hydrants.

Utica, N. Y.—Chief Sullivan asked for fifty hydrants, sleighs and alarm boxes.

Watertown, Mass.—Voted to buy combination wagon.

CONTRACTS AWARDED

Cincinnati, O.—J. F. Heineman has contract for hose house.

Knoxville, Tenn.—Fire Extinguisher Mfg. Co. has contract for remodeling truck at $3,250.

(Concluded on page 24.)

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WRITE FOR BOOKLETS

Los Angeles, Cal.—Nott Fire Engine Co. received contract for three engines at $14,250.

Porterville, Cal.—R. S. Chapman received contract for 500 feet of hose at 80 cts. a foot.

Rochester, N. Y.—R. D. Wood & Co., Philadelphia, received contract for 115 hydrants at $2,697.50.

St. Paul, Minn.—American-La France Fire Engine Co. has contract for new engine at $4,350.

Syracuse, N. Y.—Contract for 5,000 feet of hose let Eureka Hose Co. at 68½ cts. per foot.

Trenton, N. J.—American-La France Engine Co. will supply city with three new engines at $5,000 each.

MISCELLANEOUS

Albany, N. Y.—Considering plans for garbage collection and disposal to cost $90,000 a year.

Alexandria, La.—Considering garbage crematory. President Board of Health.

Barberton, O.—Mayor Miller recommended a special bond for garbage disposal plant.

Binghamton, N. Y.—Considering the subject of street signs.

Bridgeport, Conn.—Bids, May 10, for collecting and disposing of garbage. Pres. Bd. of Health.

Charleroi, Pa.—Have sold $9,000 bonds for garbage crematory.

Cleveland, O.—City Auditor J. P. Madigan wrote that bids were to be received April 25 for $255,000 park bonds and $5,000 bonds for a public bath house.

Columbus, Ga.—Will vote, July 8, on $50,00 bonds for improvements. The Mayor.

Columbus, O.—Will build expensive sewage disposal plant.

Duluth, Minn.—It is said that garbage collection and disposal is being considered.

Elmira, N. Y.—Considering garbage collection and disposal. Mayor Coleman.

Fall River, Mass.—B. H. Barney has five-year contract for collecting garbage.

Fresno, Cal.—Intercepting sewer and septic tank proposed to cost $26,000. City Engineer Tielman.

Jersey City, N. J.—May improve River View Park.

Kansas City, Mo.—Plans approved for septic tank and sewer system to cost $25,000. City Engineer Pike.

Manchester, Conn.—A. M. Banker, Gloversville, N. Y., has contract for septic tank.

Meridian, Miss.—Will issue $40,000 bonds for park purposes.

Mt. Vernon, N. Y.—Chas. DeLane has two-year contract for removing garbage and ashes.

Norfolk, Va.—J. B. Robertson has contract for removing garbage.

Oakland, Cal.—Will vote on $95,000 bonds for playgrounds and $983,000 for parks, etc.

Omaha, Neb.—City Garbage Co. has three-year contract.

Owensboro, Ky.—H. W. Ergenmann has contract for sprinkling and will need wagons.

Pittsfield, Mass.—Bids were to be asked for garbage disposal and street cleaning. City Engineer Fobes.

Plainfield, N. J.—Considering garbage disposal to cost $10,000.

Reading, Pa.—Contemplating enlargement of sewage disposal plant.

Rockville, Conn.—Considering sewage filter bed.

Saginaw, Mich.—May have $20,000 garbage plant.

Shreve, O.—Considering sewage disposal plant.

Troy, N. Y.—May spend $175,000 on park development.

Waxhaw, N. C.—Garbage disposal and street cleaning proposed. Mayor G. H. Burgess.

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